Key Points & Instructor Guide

Use Slide 179.2/11.3.4
Slide 179.2/11.3.4 is a schematic flow diagram of an extended aeration facility

Comment on problems caused by not having a primary clarifier

D. Step Feed

1. Use step feed diagram to illustrate how mode change can be used in problem solving.

2. Step feed can be varied from conventional to contact mode. Use slide to show how this change is accomplished.

3. By increasing or decreasing the tank volume used for sludge reaeration the sludge inventory and sludge aeration time can be varied over wide ranges.

4. Conditions which might indicate mode change (assume that system is being operated in conventional mode before change is affected):

   a. Sudden increase in hydraulic load (storm water run-off) - change to contact mode to protect sludge inventory.

   b. Sludge begins to settle slowly and RR begins to increase - change to sludge reaeration mode to increase sludge inventory and sludge aeration time. Cause sludge to become more stable, settle faster and lower RR.

   c. Troubleshooter may see system as an extreme problem - very slow settling sludge spilling over weirs or severely over-oxidized sludge which has deflocculated and losing excess solids. Mode changes offer quick response to correct these conditions.

Key Points & Instructor Guide

Use Slide 179.2/11.3.5
Slide 179.2/11.3.5 is a schematic flow diagram of a step feed activated sludge plant

E. Other Variations

1. Complete Mixing

   a. Complete mixing provides some protection against "shock" or "slug" loads.

   b. Operating parameters

      1) F/M: 0.2-0.6 #BOD5/#MVLSS/day

      2) Aerator Loading: 50-120 #BOD5/1000 ft^3

      3) MLSS: 3000-6000 mg/l

      4) Detention Time: 3-5 hours

      5) MCRT: 5-15 days

      6) Return sludge flow rate: 25-100% of influent

   c. Higher loadings tend to produce a slower settling sludge than conventional processes but otherwise the operation is similar.

2. Oxidation Ditch-an extended aeration plant with an "oval doughnut" aeration basin configuration. Brush aerators are used to circulate mixed liquor around the aeration basin. Sometimes called a "Dutch Ditch" or "Race Track".

3. Tapered aeration - a conventional plug flow plant with the air application tapered from the head of the plant (high oxygen demand zone and higher aeration rate) to the effluent end of the tank (low oxygen demand zone and lower aeration rate).

Key Points & Instructor Guide

Use Slide 179.2/11.4.5
Slide 179.2/11.4.5 is a schematic diagram of the complete mixing activated sludge process

Use Slide 179.2/11.3.6
Slide 179.2/11.3.6 is a blank

Refer class to Field Manual for Performance Evaluation and Troubleshooting at Municipal Wastewater Treatment Facilities, page 57.

III. Examples of Mode Change for Process Trouble shooting (5 minutes)

A. Ask class to cite examples from their experience of mode changes used for process control or troubleshooting.

B. Discuss class inputs

C. Instructor should be prepared to cite examples if class does not offer examples.

Key Points & Instructor Guide

Example of Mode Change for Process Troubleshooting and Operational Control. (Example is based on the experiences of the Operational Technology Branch, National Training and Operational Technology Center, U.S. Environmental Protection Agency, Cincinnati, Ohio).

1. Plant design is about 2 MGD

2. Plant has two aeration basins which can be operated

   a. In series, plug flow

   b. In parallel

   c. One tank on-line, one tank off-line

   d. One tank as "Contact basin" and one tank as "reaeration basin"

3. Large portion of raw waste comes from a large bakery which discharges a high carbohydrate waste with high grease and oil content.

4. Plant has constant slow settling (bulking) sludge problems when aeration basins are operated in series or in parallel. Solids cannot be retained in the system.

5. By operating with one tank as a contact tank and the other as a reaeration tank, the solids could be retained and stabilized. However, prolonged operation in this mode resulted in over-oxidation of the sludge producing a fast settling sludge which left a turbid effluent which exceeded TSS standards.

6. Plant personnel were taught to monitor sludge settling characteristics and to switch the plant from the "reaeration operating mode" to an operating mode with the aeration tanks in parallel when sludge settling began to increase. As settling rates became slower, the plant was switched back to the "reaeration" mode.

7. The plant operated for over a year using mode change to control sludge quality and consistently produced a high quality effluent which exceeded NPDES permit requirements.

Training Sample 12
"Unit 11: Activated Sludge, Instructor Notebook"
TROUBLESHOOTING O & M PROBLEMS IN WASTEWATER TREATMENT FACILITIES
NTOTC
Cincinnati, Ohio 45268
December 1979

Lesson 7 of 14 lessons
Recommended Time: 90 minutes

Purpose: Four major process control decision making tools, F/M, MCRT, Sludge Settleability and RR, are used in activated sludge process control, evaluation and troubleshooting. Many operators and troubleshooters routinely use only one or two of these tools and, therefore, attempt to control the process based on limited or partial information. The problem solving exercise in this lesson requires the trainee to solve a generalized process control problem, identify the possible causes of the problem, describe how the actual problem cause would be determined and recommend corrective actions for each possible cause identified. The exercise forces the trainee to look at the interrelationships between the various process control decision making tools.

Trainee Entry Level Behavior: Trainees should have achieved the learning objectives specified for Unit 11, Lessons 1 - 6 before beginning this lesson.

Trainee Learning Objectives: At the conclusion of this lesson, the trainee will be able to:

1. Given design information about a model activated sludge treatment plant, information that a change has occurred in one of the parameters F/M, MCRT, Sludge Settleability or RR and using Trainee Notebook references and class notes, list all possible causes of the observed change in the process control parameter, describe the expected change in other process control parameters which would confirm each possible cause as the most likely cause and list the recommended process control responses to each possible cause of the observed change in the process control parameter.

2. When called upon by the instructor, report his/her findings for the given conditions and justify his/her recommendations for process control responses.

3. Using class notes and Trainee Notebook references, explain why it is necessary to consider concurrent changes in at least four parameters, F/M, MCRT, Sludge Settleability and RR, when evaluating an activated sludge system to identify problems and their probable causes.

Instructional Approach: Trainee problem solving in work groups of four trainees and discussion of trainee findings.

Lesson Schedule: The 90 minutes allocated to this lesson should be scheduled as follows:

TIME	SUBJECT
0 - 10 minutes	Instructor Introduces the Problem
10 - 45 minutes	Trainee Problem Solving
45 - 85 minutes	Trainees Report Findings
85 - 90 minutes	Instructor Summarized Lesson

Trainee Materials Used in Lesson:

1. Trainee Notebook, page T11.7.1, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response - Problem Statement."

2. Trainee Notebook, page T11.7.4, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response - Instructions for Completing Worksheet."

3. Trainee Notebook, page T11.7.5 - T11.7.12, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response-Worksheets.

4. All trainee references and Trainee Notebook materials used in Unit 11, Lessons 1 - 6.

Instructor Materials Used in Lesson:

1. Instructor Notebook, Unit 11, Lesson 7, pages 11.7.1 -11.7.9.

2. Instructor Notebook, pages H11.7.1 - H11.7.37, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response" (to be reproduced and distributed to trainees at the conclusion of the lesson.)

Instructor Materials Recommended for Development: None

Additional Instructor References: As specified in Unit 11, Lessons 1 - 6.

Classroom Set-Up:

1. Lesson Introduction: As specified in Unit 11, Lessons 1.

2. Trainee Problem Solving: One separate breakout room for each trainee workgroup so that individual work groups have a private quiet area in which to meet and discuss the work group's assigned problem.

3. Trainees Report Findings: As specified in Unit 11, Lesson 1.

Lesson Outline

I. Instructor Introduces the Problem (10 minutes)

A. Introduction

1. Have discussed several process control and evaluation tools and their significance.

a. F/M

b. MCRT

c. Sludge Settleability

d. RR

2. Now its time to apply what has been covered to activated sludge process troubleshooting.

3. Do this by developing a series of process control and troubleshooting guides.

Key Points & Instructor Guide

Refer class to Trainee Notebook, pages T11.7.1-T11.7.11 for a statement of the problem, instructions and worksheets.

B. Have class read Problem Situation

1. Refer class to Trainee Notebook, page T11.7.1-T11.7.2 for a statement of the situation. Trainee Notebook pages T11.7.1-T11.7.11 are included in the Instructor Notebook.

2. Emphasize that the situation is designed to provide a maximum of process control flexibility which is available to the operator and troubleshooter. The specifics of plant design are really immaterial to this problem.

3. The objective is to provide specific guidelines to the operator on how to correctly use the available process flexibility to achieve and maintain good effluent quality.

C. Instructions for Completing the Problem Worksheets

1. Refer class to Trainee Notebook, pages T11.7.4 - T11.7.11, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response Worksheets" and page T11.7.3 for "Instructions for Completing Worksheets". These pages are included in the Instructor Notebook.

2. Review instructions and worksheets with the class.

Key Points & Instructor Guide

Instructor should refer to pages H11.7.1-H11.7.37 which are the completed worksheets to gain a better understanding of the expected trainee responses to the worksheet exercise.

D. Make Worksheet Assignments

1. Assign worksheets to trainee workgroups for completion.

   a. Trainee Group 1, page T11.7.4, F/M Increasing.

   b. Trainee Group 2, page T11.7.5, F/M Decreasing.

   c. Trainee Group 3, page T11.7.6, MCRT Increasing.

   d. Trainee Group 4, page T11.7.7, MCRT Decreasing.

   e. Trainee Group 5, page T11.7.8, MLSS RR Increasing.

   f. Trainee Group 6, page T11.7.9, MLSS RR Decreasing.

   g. Trainee Group 7, page T11.7.10, Settling Rate Increasing.

   h. Trainee Group 8, page T11.7.11, Settling Rate Decreasing.

2. Each work group should complete its assigned worksheet by working as a team. Stress the importance of discussion within the group.

3. Work groups will have about 35 minutes to complete their assigned worksheets.

4. Inform work groups that when the class reconvenes, each work group will report its findings to the class and justify its recommendations.

E. Direct Work Groups to Their Work Areas

1. Separate work areas, preferably separate rooms, should be provided for each work group so that the group may freely discuss the assigned problem and develop a group concensus solution without interfering with the work of another group.

2. Assign a work area to each group and give directions for finding the assigned work area.

F. Answer any questions about the exercise before sending groups to their work areas.

II. Trainee Problem Solving (35 minutes)

A. Circulate among work groups to monitor progress and answer questions.

B. Review each work group's product periodically and redirect their efforts as necessary.

C. If a group completes the assigned work sheet early, assign a second work sheet to the group.

D. Periodically inform groups of time remaining.

E. Reconvene groups in the main classroom at the end of the 35 minute work period.

III. Trainees Report Findings (40 minutes)

A. Reconvene class in main classroom.

B. Have work groups report their findings.

1. Call on groups sequentially, beginning with Group 1, to report findings (allocate about 8 minutes per group).

a. Group 1 - F/M Increasing

b. Group 2 - F/M Decreasing

c. Group 3 - MCRT Increasing

d. Group 4 - MCRT Decreasing

e. Group 5 - MLSS RR Increasing

f. Group 6 - MLSS RR Decreasing

g. Group 7 - Settling Rate Increasing

h. Group 8 - Settling Rate Decreasing

2. Encourage class discussion as each possible cause is presented.

3. Using the suggested solutions on pages H11.7.1-H11.7.37, challenge groups to justify their recommendations as appropriate.

4. Note that there is overlap and commonality between the correct responses for the eight observed conditions given in the worksheets, e.g., a rising F/M will cause a decreasing settling rate and an increasing MLSS RR which could be associated with a decreasing MCRT. Therefore, several groups should identify the same probable causes, confirmation observations and control responses. Use this information to draw several groups into the discussion.

5. Distribute solutions to the class after discussion is complete.

Key Points & Instructor Guide

School Solutions
Refer to pages H11.7.1-H11.7.7

Refer to pages H11.7.8-H11.7.13

Refer to pages H11.7.14-H11.7.15

Refer to pages H11.7.16-H11.7.19

Refer to pages H11.7.20-H11.7.23

Refer to pages H11.7.24-H11.7.28

Refer to pages H11.7.29-H11.7.33

Refer to pages H11.7-34-H11.7.37

Reproduce pages H11.7.1 - H11.7.37 in sufficient quantity to distribute to the class.

A. Using one solution sheet, page T11.7.4, the F/M increasing case, point out that there were many things which could have caused this observation. Point out that the correct process control response was different for each possible cause of the problem although several other control responses could be made to reverse the observed increase in F/M if this were the only information available to the operator and troubleshooter.

B. Point out that by looking at the four control parameters, F/M, MCRT, Sludge Settleability and MLSS RR, together it is fairly easy to eliminate several possible causes and narrow the list to the one most likely cause.

C. After identifying the cause of the problem, a correct process control response decision can be made.

D. Emphasize the importance of looking at all available information about the process before making a process control decision and changing process control variables. Incorrect control responses can be made if only one parameter is considered. This may cause more problems that it solves.

E. Recommend that routine monitoring of F/M, MCRT, Sludge Settleability and process respiration rates be considered for all activated sludge plants. If it is practical (personnel and dollar resources available) to institute a comprehensive process control management system, the process can be controlled to produce good effluents consistently.

Training Sample 13
"Unit 11: Activated Sludge, Trainee Notebook"
TROUBLESHOOTING O & M PROBLEMS IN WASTEWATER TREATMENT FACILITIES
NTOTC
Cincinnati, Ohio 45268
December 1979

Trainee Notebook Contents

Problem Identification and Process Control Response - Problem Statement T11.7.1

Flow Schematic for Use in Problem Solving. T11.7.3

Problem Identification and Process Control Response - Instructions for Completing Worksheet. T11.7.4

Problem Identification and Process Control Response - Worksheets. T11.7.5

Activated Sludge Process Troubleshooting

Problem Identification and Process Control Response

Problem Statement

While attending a local operator association meeting, you are introduced to John Schmitt, superintendent at a new 10 MGD step feed activated sludge plant. John has heard that you are an expert in activated sludge process control and asks you to help him solve recurrent process control problems which have occurred at the new plant. The plant has been in operation about a year but has never consistently produced a good effluent.

John informs you that he was superintendent at the city's old trickling filter plant which was replaced by the new activated sludge plant about a year ago. John confesses that he knows very little about activated sludge treatment and process control. Everything he knows about process control in the plant he got from the O & M manual which was prepared by the design firm as the new plant was constructed. Because he knows little about activated sludge, John has mechanically followed the process control procedure outlined in the O & M manual but has never been able to get the plant to perform properly.

The plant design flow is 10 MGD. There are separate storm water and sewage collection systems. The raw sewage is pumped to the plant headworks from a large lift station which is equipped with one variable speed 5000 gpm, one constant speed 5000 gpm and one constant speed 3000 gpm raw sewage pumps activated by level controllers in the wet well. Preliminary treatment consists of bar screening, comminution, grit removal and flow measurment. The pretreated waste is fed to two circular primary clarifiers. The primary effluent from the two tanks discharges to a common channel which feeds the aeration basin. The aeration basin has step feed capability at the quadrant points in the four pass plug flow aeration tank. Mixed liquor is distributed to two circular final clarifiers. The final clarifier effluent is chlorinated before discharging to the river. The underflow from the two clarifiers discharges to a common return sludge wet well. There are two variable speed 5000 gpm return sludge pumps. All return sludge discharges to the first quadrant of the aeration basin. Return sludge flow is metered, and the return sludge flow can be varied from 1400 to 10,000 gpm. Waste activated sludge is pumped from the return sludge wet well to the primary clarifiers. The waste sludge pump is a 1500 gpm constant speed pump activated by a time clock mechanism. There have been no problems in solids handling.

John informs you that there are several industries in town which discharge to the plant and sometimes cause relatively large variations in hydraulic and organic load to the plant. The average daily flow to the plant is 9.0 MGD.

John always operates the plant in the conventional treatment mode with all influent wastewater and return sludge entering the first quadrant of the aeration basin. John normally operates with a constant return sludge flow rate of about 6 MGD and only varies the return rate if the sludge blanket in the final clarifier begins to fall or rise. A constant volume of sludge is wasted each day because the waste rate has not been changed from the wasting rate set by the engineer during plant start-up.

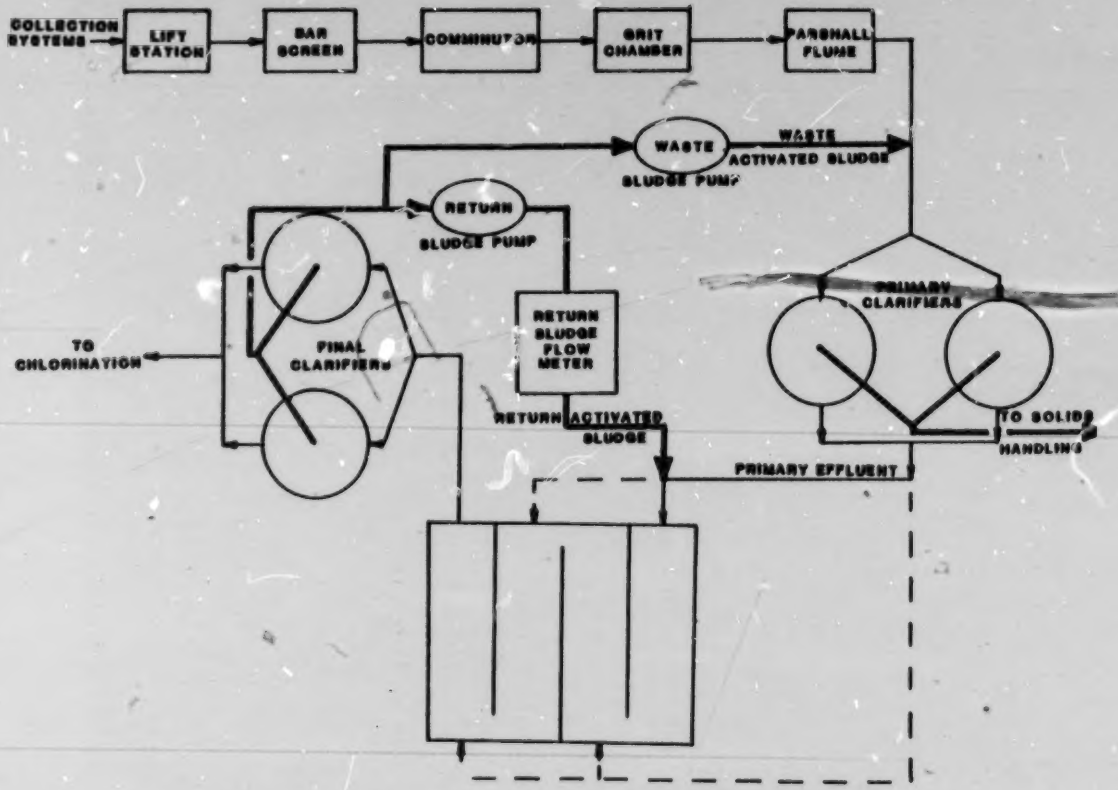
John tells you that plant performance is erratic. Sometimes the sludge bulks and washes out of the final clarifiers. Sometimes the sludge separates very well in the final clarifiers but leaves a turbid ashy type effluent. Sometimes the plant produces a good effluent but not very often. John is upset because he had been told that this plant would produce an excellent effluent and consistently meet his discharge permit requirement of 20 mg/l BOD and 20 mg/l TSS. But he can't seem to make the thing work.

John tells you that he has a well equipped laboratory and a good lab technician who's running all the tests specified in the O & M manual and the permit. John knows that these test results should be used in controlling the plant but he doesn't know what the test results mean or how to use them.

John wants you to teach him how to make the plant work. You decide to accept the job.

To accomplish the task, you decide to develop a series of process control and troubleshooting charts as work aids which John can use to help him interpret his process control laboratory data.

You will use the attached worksheets, pages T11.7.5 - T11.7.12 to develop the process control and troubleshooting charts. You and the members of your workgroup will be assigned one worksheet to complete. After you have completed your assigned worksheet, you will present the information from your worksheet to the class.



FLOW SCHEMATIC FOR USE IN PROBLEM SOLVING

Activated Sludge Process Troubleshooting

Problem Identification and Process Control Response

Instructions for Completing Worksheet

1. Prepare the worksheet in the context of the problem statement, i.e., a very flexible plant design which can accommodate many different process control adjustments in response to observed process conditions.

2. A change is observed in one process control parameter as specified at the top of the worksheet.

3. Possible Causes of Observed Condition. Possible Cause: List all things which could have occurred in the system to cause the change observed in the monitored parameter. Be as specific as possible. For example, if one possible cause for the observed condition is a change in applied load, specify the ways in which the load change could occur. Applied BOD load could increase because (a) the influent BOD concentration increases with flow remaining constant (b) the influent flow rate increases with the BOD concentration remaining constant, (c) both flow rate and BOD concentration increase, (d) an internal plant recycle stream is returned to the aeration basin, etc.

   Observations and Data to Confirm Cause: What additional observations and tests would you perform to confirm this as the cause of the problem and what result would you expect to see? For each possible cause, include the expected change in F/M, MCRT, Sludge Settleability and MLSS RR as your minimum entry in this column.

4. Process Control Response to Observed Condition. For each possible cause of the observed condition, enter the correct process control response. Process control responses should be considered as immediate or temporary (things to do right now to solve an immediate problem) and long term (things to be done which will correct the problem and prevent possible recurrence of the problem). For example, suppose the sludge settling rate decreases because of organic overload and the final clarifier sludge blanket becomes very high and solids wash-out from the clarifier is imminent. Then an immediate response may be to lower the sludge blanket by increasing return rate temporarily to prevent solids wash-out, but the long term solution to correct the problem may be to reduce return sludge rate and increase solids inventory. Be as exact and complete as possible in listing process control responses.

Activated Sludge Process Troubleshooting

Problem Identification and Process Control Response

Worksheet

PARAMETER MONITORED: F/M CONDITION OBSERVED: F/M Increasing

POSSIBLE CAUSES OF OBSERVED CONDITION:

Possible Cause	Observations and Data to Confirm Cause
1.	
2.	
3.	
4.	
5.	

PROCESS CONTROL RESPONSE TO OBSERVED CONDITION:

Possible Cause	Immediate or Temporary Response	Long Term Corrective Action
1		
2		
3		
4		
5		

Training Sample 14
"Unit 11: Activated Sludge, Instructor Handout"
TROUBLESHOOTING O & M PROBLEMS IN WASTEWATER TREATMENT FACILITIES
NTOTC
Cincinnati, Ohio 45268
December 1979

Instructor Handout Contents

Problem Identification and Process Control
Response - Answer Sheets . . . . . H11.7.1 - H11.7.37

Activated Sludge Process Troubleshooting

Problem Identification and Process Control Response

PARAMETER MONITORED: F/M
OBSERVED CONDITION: F/M Increasing

POSSIBLE CAUSES OF OBSERVED CONDITION:

Observations and Data to Confirm Cause

1. Settling rate - decreasing
   MLSS RR - increasing
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - increasing
   Influent Flow Rate - about the same
   Aeration Basin D.O. - decreasing

   Possible Causes - Increased organic load caused by increased influent BOD concentration with little change in influent flow rate

2. Settling rate - decreasing or no change
   MLSS RR - increasing or no change
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - increasing
   Influent Flow Rate - decreasing
   Aeration Basin D.O. - decreasing or about the same

   Possible Causes - Increased organic load caused by increased influent BOD concentration with a decrease in influent flow rate

3. Settling Rate - usually decreasing
   MLSS RR - increasing
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - about the same
   Influent Flow Rate - increasing
   Aeration Basin D.O. - decreasing

   Possible Causes - Increased organic load caused by increase in influent flow rate with little change in influent BOD concentration

4. Settling Rate - decreasing or no change
   MLSS RR - increasing or no change
   MCRT - Constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - decreasing
   Influent Flow Rate - increasing
   Aeration Basin D.O. - decreasing or about the same

   Possible Causes - Increased organic load caused by increase in influent flow rate with a decrease in influent BOD concentration

5. Settling Rate - Decreasing
   MLSS RR - increasing
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - increasing
   Influent Flow Rate - increasing
   Aeration Basin D.O. - decreasing

   Possible Causes - Increased organic load caused by increase in both influent BOD and influent flow rate

6. Settling Rate - decreasing
   MLSS RR - increasing
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - about the same if sample collected before recycle stream enters the aeration system
   - increasing if sample collected after recycle stream enters the aeration system
   Influent Flow Rate - about the same
   Aeration Basin D.O. - decreasing

   Possible Causes - Increased organic load caused by internal plant recycles

7. Settling Rate - decreasing
   MLSS RR - increasing
   MCRT - decreasing
   Solids Inventory - decreasing
   Fed Sludge RR - about the same
   Aeration Basin D.O. - increasing or about the same

   Possible Causes - Decrease in solids inventory caused by excessive deliberate wasting

8. Settling Rate - decreasing
   MLSS RR - increasing
   MCRT - decreasing
   Solids Inventory - decreasing
   Fed Sludge RR - about the same
   Influent Flow Rate - about the same
   Aeration Basin D.O. - increasing or about the same

   Possible Causes - Decrease in solids inventory caused by excessive effluent suspended solids

9. Settling Rate - no change
   MLSS RR - no change
   MCRT - no change
   Solids Inventory - no change
   Fed Sludge RR - no change or increasing
   Influent Flow Rate - about the same
   Aeration Basin D.O. - about the same

   Possible Causes - Nitrification occurring in BOD test used to measure applied load

PROCESS CONTROL RESPONSE TO OBSERVED CONDITIONS:

Possible Cause 1

1. Immediate or Temporary Response

   a. Check final clarifier sludge blanket depth.

      1. If the blanket is rising rapidly with possibility of solids washout, then temporarily increase return rate or waste rate to lower sludge blanket. Reduce return or waste rate as soon as blanket can be retained in final clarifier. CAUTION: Increased hydraulic load on clarifier may cause solids washout. This action may cause slow sludge settling problem to get worse before long range corrective actions affect process. This temporary response is a calculated risk!

      2. If the sludge blanket is not out of control, implement long term corrective actions.

   b. Check aeration basin D.O. If D.O. is less than 1 mg/l, increase air supply.

2. Long Term Corrective Action

   a. When sludge blanket can be retained in final clarifier, reduce return sludge flow rate-concentrates return sludge and increases aeration detention time.

   b. Reduce deliberate wasting to increase solids inventory and sludge aeration time. Continue to monitor F/M, sludge settleability and MLSS RR and balance system to new conditions of solids inventory and MCR to treat increased load.

   c. If a and b don't work, then

      1. Increase aeration detention time by placing additional aeration basins into service.

      2. Increase sludge detention time by converting to sludge reaeration operating mode.

Possible Cause 2

1. Immediate or Temporary Response

   (Same as possible cause 1 responses)

2. Long Term Corrective Action

   a. If settling rate and MLSS RR are not changing, continue current operating practices but monitor settleability and MLSS RR frequently and respond to any changes which occur because of increased organic load.

   b. If settling rate is decreasing and MLSS RR is increasing, then implement corrective actions listed for possible cause 1.

Possible Cause 3

1. Immediate or Temporary Response

   (Same as possible cause 1 responses)

2. Long Term Corrective Actions

   (Same as possible cause 1 responses)

Possible Cause 4

1. Immediate or Temporary Response
   (Same as possible cause 1 responses)

2. Long Term Corrective Actions

   (Same as possible cause 2 reponses)

Possible Cause 5

1. Immediate or Temporary Response

   (Same as possible cause 1 responses)

2. Long Term Corrective Actions

   Same as possible cause 1 responses. Need to use additional aeration volume or sludge reaeration to handle new load is more likely for these influent load conditions.

Possible Cause 6

1. Immediate or Temporary Response
   a. Same as possible cause 1 responses

   b. Identify source of internal recycle and modify operations creating the internal recycle to eliminate or reduce the recycle, if possible

2. Long Term Corrective Actions

   a. Same as possible cause 1 responses

   b. If internal recycles cause serious problems which interfere with treatment of influent wastewater, the recycles cannot be eliminated and the aeration system cannot be controlled by responses in a, then

      1. Pre-treat recycle streams before returning to aeration system;

      2. Provide means to equalize recycle loads and bleed them into aeration system;

      3. Pre-aerate recycle streams before returning to aeration system;

      4. Consider and evaluate use of chemical additives such as coagulants and coagulant aids in aeration system to maintain process integrity.

Possible Cause 7

1. Immediate or Temporary Response

   (Same as possible cause 1 reponses)

2. Long Term Corrective Actions

   a. Decrease waste activated sludge to increase solids inventory. Monitor F/M and MCRT and readjust wasting rate when parameters are in optimum range.

   b. Decrease return activated sludge flow rate to concentrate return and increase aeration basin detention time

   c. If a and b are not effective

      1. Increase aeration volume in use

      2. Use sludge reaeration mode of operation

Possible Cause 8

1. Immediate or Temporary Response

   a. Same as possible cause 1 responses

   b. Check and evaluate final clarifier operation and design for possible problems

      1. Sludge collection, return or wasting systems not operating properly

         a. Rake or collector drive mechanism broken or shut off because of torque overload

         b. Broken chains

         c. Missing flights or scrappers

         d. Plugged collectors or pumps

         e. Pumps not operating

      2. Hydraulic overload

      3. Solids overload

      4. Improperly maintained clarifier weirs

5. Unequal load distribution to multiple clarifiers

6. Improperly designed clarifier

   a. High velocity currents at weirs

   b. Short circuiting

2. Long Term Corrective Action

   a. Same as possible cause 7 responses

   b. Correct final clarifier deficiencies
      1. Sludge collection, return or wasting systems not operating properly

         a. Repair or reset

         b. Repair or replace

         c. Repair

         d. Unplug collectors or pumps

         e. Repair or reset pumps

      2. Hydraulic overload

         a. Put additional clarifiers in service, if possible

         b. Reduce hydraulic load to clarifier, if possible

      3. Solids overload

         a. Put additional clarifiers in service

         b. Reduce solids load to clarifier, if possible

         c. Take actions to produce faster settling solids (possible cause 7 responses)

      4. Improperly maintained clarifier weirs

         (Check weirs for level and level if necessary)

5. Unequal load distribution to multiple clarifiers

   a. Check weirs to verify that all clarifiers have same weir elevation. Adjust as needed.

   b. Check inlet and effluent structures for obstructions - remove obstructions

   c. Check and adjust flow distribution system

6. Improperly designed clarifier

   a. High velocity currents at weirs
      1. Check adequacy of total weir length. Add weirs if needed

      2. Block excess weirs which may cause localized velocity currents

      3. If velocity currents caused by weir placement too close to wall, move weirs away from wall

   b. Short circuiting

      1. Check and adjust weirs

      2. Check adequacy of inlet target baffles and skirts. Correct target baffles and skirt deficiencies.

      3. If inlet velocities are excessive, provide mechanism to dampen inlet velocities

      4. Check for thermal stratification in clarifier. Eliminate cause of thermal stratification.

Possible Cause 9

1. Immediate or Temporary Response

   (None)

2. Long Term Corrective Action

   a. Continue operation using current practices if process is performing well and there are no other problems

b. Check, evaluate and correct BOD test procedure. Most likely cause is high nitrifier population in seed organisms used in BOD test

   1. Change seed

   2. Inhibit nitrification in BOD test using alternate procedure

   NOTE: This problem frequently occurs in effluent BOD determination also

c. Nitrification in influent BOD test may be desirable, and hence, this is not a problem.

PART III

Abstracted Reference Materials

TITLE ACTIVATED SLUDGE.
AUTHOR SCHROEDER, E. D.
CORP AUTH CALIFORNIA UNIV., DAVIS.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 47 NO 6, P 1261-1269, JUNE, 1975. 101 REF.
KEYWORDS *REVIEWS, *BIBLIOGRAPHIES, *ACTIVATED SLUDGE, *WASTE WATER TREATMENT, INDUSTRIAL WASTES, PHOSPHORUS, NITROGEN, NUTRIENT REMOVAL, DESIGN, OPERATIONS, MATHEMATICAL MODELS, AERATION, WASTE TREATMENT, WATER POLLUTION CONTROL, PULP WASTES, CONTROL, HEAVY METALS, BIOCHEMISTRY, MICROBIOLOGY, TOXINS, SLUDGE TREATMENT, SLUDGE DISPOSAL, ECONOMICS, COSTS.
ABSTRACT THE 1974 LITERATURE ON THE TREATMENT OF WASTE WATERS BY THE ACTIVATED SLUDGE PROCESS IS REVIEWED. TOPICS DISCUSSED INCLUDE: PROCESS MODELS, CONTROL, AND DESIGN AND OPERATION OF ACTIVATED SLUDGE PLANTS; MICROBIOLOGY AND BIOCHEMISTRY OF THE PROCESS; REMOVAL OF HEAVY METALS AND EFFECTS OF TOXICANTS; INDUSTRIAL WASTE WATER TREATMENT; AERATION; NITROGEN AND PHOPHORUS REMOVAL; SLUDGE THICKENING AND DISPOSAL; AND COSTS OF ACTIVATED SLUDGE PLANTS. REFINERY, PULP AND PAPER, AND DISTILLERY WASTES ARE CITED AS EXAMPLES OF SOME OF THE WASTE MATERIALS THAT ARE BEING TREATED BY THE ACTIVATED SLUDGE PROCESS. (WITT-IPC)

TITLE ACTIVATED SLUDGE BASIC DESIGN CONCEPTS.
AUTHOR MCKINNEY, ROSS E.; OFERIEN, WALTER J.
CORP AUTH KANSAS UNIV., LAWRENCE.
AVAIL JOURNAL OF WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 11, PART 1, P 1831-1834, NOV 1968. 16 REF.
IDEN SCREENING, PRIMARY SEDIMENTATION, SECONDARY SEDIMENTATION.
KEYWORDS *ACTIVATED SLUDGE, *AERATION, *DESIGN, *WASTE WATER TREATMENT, HISTORY, MIXING, SETTLING BASINS, SLUDGE DISPOSAL.
ABSTRACT THE DESIGN OF ACTIVATED SLUDGE SYSTEMS HAS EVOLVED SLOWLY AND PROGRESS HAS BEEN MADE LARGELY ON AN EMPIRICAL BASIS. THIS PAPER PRESENTS THE BASIC DESIGN CONCEPTS FOR A MODERN ACTIVATED SLUDGE SYSTEM INCLUDING THE FOUNDATIONS ON WHICH THESE CONCEPTS WERE DEVELOPED. DESIGN PARAMETERS DEVELOPED FOR CONVENTIONAL AND COMPLETELY MIXED SYSTEMS INDICATE THAT AERATION WILL BE FROM 3 TO 8 HOURS. TOTAL MLSS WILL RANGE FROM 1500 TO 4000 MG/L, ORGANIC LOADS OF 0.5 TO 0.7 LB BOD/LB

MICROBIAL SOLIDS WILL YIELD GOOD OPERATIONS, AND DIFFUSED AERATION OF 1000 CUBIC OF AIR PER POUND OF BOD REMOVED IS A SOUND PARAMETER. ALL ASPECTS OF ACTIVATED SLUDGE SCHEMES ARE DISCUSSED WITH DESIGN PARAMETERS GIVEN. (HANCUFF-TEXAS)

TITLE ACTIVATED SLUDGE PROCESS WORKSHOP MANUAL
PUB DATE JUL 76
AVAIL PUBLICATIONS CENTRE, ONTARIO MINISTRY OF GOVERNMENT SERVICES, 880 BAY STREET, 5TH FLOOR, TORONTO, ONTARIO, CANADA M7A 1N8 ($2.00; ORDERS MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER PAYABLE TO "THE TREASURER OF ONTARIO")
DESC *BEHAVIORAL OBJECTIVES, *CHEMISTRY, *ENVIRONMENTAL EDUCATION, ENVIRONMENTAL TECHNICIANS, JOB SKILLS, *POLLUTION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *WORKSHOPS, ACTIVATED SLUDGE, ONTARIO
ERIC NO. ED155033
EDRS PRICE EDRS PRICE MF-$0.83 PLUS POSTAGE. HC NOT AVAILABLE FROM EDRS
DESC NOTE 242P.; FOR RELATED DOCUMENT, SEE SE 024 226-233; NOT AVAILABLE IN HARD COPY DUE TO COPYRIGHT RESTRICTIONS; CONTAINS COLORED PAGES WHICH MAY NOT REPRODUCE WELL
ISSUE RIEOCT78
ABSTRACT THIS MANUAL WAS DEVELOPED FOR USE AT WORKSHOPS DESIGNED TO UPGRADE THE KNOWLEDGE OF EXPERIENCED WASTEWATER TREATMENT PLANT OPERATORS. EACH OF THE LESSONS IN THIS DOCUMENT HAS CLEARLY STATED BEHAVIORAL OBJECTIVES TO TELL THE TRAINEE WHAT HE SHOULD KNOW OR DO AFTER COMPLETING THAT TOPIC. AREAS COVERED IN THIS MANUAL INCLUDE: TYPES AND FACTORS AFFECTING ACTIVATED SLUDGE PROCESSES, IDENTIFICATION AND SOLUTION OF OPERATING PROBLEMS, SELECTED TESTS AND MEASUREMENT, AND CHEMICAL DETERMINATIONS. A GLOSSARY OF TERMS IS INCLUDED FOR REFERENCE. (CS)

TITLE ACTIVATED SLUDGE. TRAINING MODULE 2.117.4.77.
PUB DATE SEP 77
DESC *INSTRUCTIONAL MATERIALS, *POST SECONDARY EDUCATION, SECONDARY EDUCATION, *TEACHING GUIDES, *UNITS OF STUDY, *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, OPERATIONS (WASTEWATER), *WASTEWATER TREATMENT
ERIC NO. ED151222
EDRS PRICE EDRS PRICE MF-$0.83 HC-$6.01 PLUS POSTAGE

DESC NOTE 11P.: FOR RELATED DOCUMENTS, SEE SE 024-025-447; CONTAINS SMALL TYPE IN FIGURES

ISSUE RIEJUL78

ABSTRACT THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH OPERATION OF ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS, AND TRANSPARENCY MASTERS. THIS IS THE THIRD LEVEL OF A THREE MODULE SERIES AND CONSIDERS DESIGN AND OPERATION PARAMETERS, PROCESS CONTROL PROCEDURES, INTERPRETATION OF TREND CHART DATA AND THE OXYGEN UPTAKE TEST. (AUTHOR/RH)

TITLE ACTIVATED SLUDGE-UNIFIED SYSTEM DESIGN AND OPERATION

AUTHOR KEINATH, T. M.; RYCKMAN, M. D.; DANA, C. H.; HOFER, D. A.

CORP AUTH CLEMSON UNIV., SC. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING.

PUB DESC JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, PROCEEDINGS OF ASCE, VOL 013, NO EE5, P 829-849, OCTOBER, 1977. 11 FIG, 2 TAB, 19 REF, 1 APPEND

DESC *ACTIVATED SLUDGE, *ANALYTICAL TECHNIQUES, *SEDIMENTATION RATES, *TREATMENT FACILITIES, *DESIGN, BIOLOGICAL TREATMENT, OPERATION AND MAINTENANCE, EVALUATION, AERATION, WASTE WATER TREATMENT

ABSTRACT THE SETTLING FLUX APPROACH CAN BE ADAPTED FOR EVALUATING ECONOMIC TRADEOFFS BETWEEN ALTERNATIVE DESIGNS FOR WASTE WATER TREATMENT SYSTEMS. THE DESIGN BASIS FOR THE AERATOR INCORPORATES SOLIDS RESIDENCE TIME AND HYDRAULIC RESIDENCE TIME. THE DESIGN BASIS FOR THE CLARIFIER INCORPORATES THE CLARIFICATION CONSTRAINT, AND A RECYCLE RATE CONSTRAINT. THIS METHODOLOGY CAN BE USED FOR EVALUATING THE ECONOMIC ASPECTS OF AN ACTIVATED SLUDGE SYSTEM CONSISTING OF AN AERATION BASIN, CLARIFIER, AND SLUDGE PROCESSING EQUIPMENT. THE SETTLING - FLUX APPROACH CAN ALSO BE USED IN OPERATIONS MONITORING OF AN ACTIVTED SLUDGE SYSTEM. THIS APPROACH INDICATES THAT INCREASED HYDRAULIC FLOW RATES WOULD ONLY CAUSE SOLIDS TO ENTER THE EFFLUENT AT CERTAIN CRITICALLY LOCATED POINTS NEAR THE SETTLING FLUX CURVE. FOR DECREASED HYDRAULIC FLOW RATES, THE RECYCLE RATE COULD BE REDUCED TO THE POINT OF CRITICAL LOADING. THE SETTLING FLUX APPROACH INDICATES THAT THE FLOW PROPORTIONAL RECYCLE CONTROLS CAN ESTIMATE THE

REQUIRED FLOW FAIRLY ACCURATELY. IT DOES NOT, HOWEVER, PROVIDE THE PRECISE RECYCLE RATE REQUIRED TO MAINTAIN THE CLARIFIER IN A CRITICALLY LOADED CONDITION. THIS APPROACH CAN ALSO ESTABLISH THE HYDRAULIC SURGE THAT A SYSTEM COULD ACCOMMODATE WITHOUT INDISCRIMINATE SOLIDS WASTING. THIS APPROACH CAN ONLY BE USED FOR OPERATIONS MONITORING AND CONTROL IF CURRENT SETTLING FLUX CURVES ARE AVAILABLE. CHANGES IN THE OPERATIONAL SET-POINT OF SOLIDS RESIDENCE TIME CAN BE ACCOMMODATED BY CHANGES IN THE SOLIDS WASTING PROGRAM. (SNYDER-FIRL)

TITLE AERATION: PROPER SIZING IS CRITICAL.
AUTHOR SHERRARD, J. H.
CORP AUTH VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF CIVIL ENGINEERING.
AVAIL WATER AND WASTES ENGINEERING, VOL 14, NO 4, P 62, 66-67, 71, APRIL, 1977. 4 FIG, 4 TAB, 6 REF.
IDEN MECHANICAL AERATORS
KEYWORDS *AERATION, *TREATMENT FACILITIES, *DESIGN, PERFORMANCE, ACTIVATED SLUDGE, MECHANICAL EQUIPMENT, OXYGEN, TEMPERATURE, MICROORGANISMS, OPERATIONS, BIOCHEMICAL OXYGEN DEMAND, NITROGEN, NITRIFICATION, *WASTE WATER TREATMENT
ABSTRACT THE SELECTION OF LOW SPEED MECHANICAL AERATORS WAS CONSIDERED. ANY AERATION METHOD MUST PRODUCE ENOUGH MIXING TO MAINTAIN ACTIVATED SLUDGE FLOC IN SUSPENSION AND SUPPLY SUFFICIENT OXYGEN TRANSER TO MEET THE DEMANDS OF MICROBIAL GROWTH. EQUATIONS WERE PROVIDED TO HELP JUDGE A GIVEN AERATOR'S PERFORMANCE. MECHANICAL AERATORS MUST MEET TWO STANDARDS: POWER, AND SUFFICIENT OXYGEN FOR MICROBIAL METABOLISM. THE FIRST DEPEND UPON THE TYPE OF AERATOR AND THE GEOMETRY OF THE BASIN. THE LATTER INVOLVES OXYGEN FOR ORGANIC REMOVAL AND NITRIFICATION, AND DEPENDS ON PLANT OPERATION AND THE BOD5/ORG-N + NH(+4) - N RATIO. BIOKINETIC COEFFICIENTS SHOULD BE ESTABLISHED TO MAKE QUALITY AND OXYGEN NEEDS PREDICTABLE AS A FUNCTION OF TREATMENT PROCESS OPERATING CONDITIONS. SEVERAL EXAMPLES OF TYPICAL SOLUTIONS WERE PRESENTED. IT WAS CONCLUDED THAT THE USE OF A RATIO OF 1 MG/LITER OF OXYGEN TO 1 MG/LITER OF BOD5 COULD BE MISLEADING AND RESULT IN A FAULTY SELECTION. NITROGENOUS OXYGEN DEMAND FROM NITRIFICATION SHOULD BE USED FOR AERATOR SELECTION IF HIGHER MEAN CELL RESIDENCE TIME VALUES ARE USED. OXYGEN TRANSFER REQUIREMENTS CAN BE MET IN SOME INSTANCES

BY LOWERING PROCESS MEAN CELL RESIDENCE TIME TO DECREASE OXYGEN NEEDS. (COLLINS-FIRL)

TITLE AN AUTOMATED SPECTROPHOTOMETRIC SUSPENDED SOLIDS ANALYSIS FOR ACTIVATED SLUDGE.

AUTHOR FINGER, R. E.; STRUTYNSKI, B. J.

CORP AUTH MUNICIPALITY OF METROPOLITAN SEATTLE, RENTON, WASH. RENTON TREATMENT PLANT

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 47, NO 5, P 1043-1054, MAY, 1975. 11 FIG, 4 TAB, 15 REF.

IDEN *SLUDGE VOLUME INDEX

KEYWORDS *ACTIVATED SLUDGE, *BIOLOGICAL TREATMENT, *SUSPENDED SOLIDS, *WASTE WATER TREATMENT, COLORIMETRY, AUTOMATION, SAMPLING, MEASUREMENT, ANALYTICAL TECHNIQUES, *POLLUTANT IDENTIFICATION, *SPECTROPHOTOMETRY

ABSTRACT THE MEASUREMENT OF SUSPENDED SOLIDS (SS) CONCENTRATION IN BIOLOGICAL WASTE TREATMENT IS USED AS A PRIMARY CONTROL, FOR PROCESS ADJUSTMENT. THE SS MEASUREMENT IS NECESSARY FOR CALCULATION OF CELL RESIDENCE TIME, ORGANIC LOADING, AND SLUDGE VOLUME INDEXES, THE DETERMINATION OF TYPES OF POLYSACCHARIDES ASSOCIATED WITH ACTIVATED SLUDGE AND THEIR EFFECTS ON THE PHYSICAL CHARACTERISTICS OF SLUDGE HAVE BEEN INVESTIGATED BY A SIMPLE COLORIMETRIC TEST. THE PURPOSE OF THIS STUDY WAS TO CONSIDER THE POSSIBILITY OF ADAPTING THIS TEST TO AN AUTOMATED PROCEDURE. A MANUAL COLORIMETRIC PROCEDURES WHICH TAKES TWO OR THREE HOURS WAS FIRST TESTED AND IT PROVED TO EFFECTIVELY MEASURE MIXED LIQUOR SUSPENDED SOLIDS AND VSS. THE AUTOMATED SPECTROPHOTOMETRIC SS TEST TAKES ONLY FIFTEEN MINUTES AND WAS DEMONSTRATED TO BE PRACTICAL FOR USE ON A CONTINUOUS BASIS. THE MAJOR PROBLEM WITH THE TECHNIQUE IS SAMPLING, WHICH MAY BE IMPROVED BY THE INSTALLATION OF A HOMOGENIZATION SYSTEM. (PRAGUE-FIRL)

TITLE BASIC ACTIVATED SLUDGE. TRAINING MODULE 2.115.2.77.

PUB DATE SEP 77

DESC *INSTRUCTIONAL MATERIALS, *POST SECONDARY EDUCATION, SECONDARY EDUCATION, *TEACHING GUIDES, *UNITS OF STUDY, *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, OPERATIONS (WASTEWATER); *WASTEWATER TREATMENT

ERIC NO. ED151220

130

EDRS PRICE EDRS PRICE MF-$0.83 HC $4.67 PLUS POSTAGE
DESC NOTE 93P.; FOR RELATED DOCUMENTS, SEE SE 024 025-047; CONTAINS OCCASIONAL LIGHT AN DBROKEN TYPE.
ISSUE RIEJUL78
ABSTRACT THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH OPERATION OF ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS, AND TRANSPARENCY MASTERS. THIS IS THE FIRST OF A THREE MODULE SERIES AND CONSIDERS, DEFINITION OF TERMS, DESIGN AND OPERATION PARAMETERS, PROCESS OBSERVATIONS, BASIC PROCESS CONTROLS AND CONTROL TESTS. (AUTHOR/RH)
INSTITUTION NAME KIRKWOOD COMMUNITY COLL., CEDAR RAPIDS, IOWA.

TITLE BASIC LABORATORY SKILLS. TRAINING MODULE 5.300.2.77.
PUB DATE SEP 77
DESC *BIOLOGY, *CHEMISTRY, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, *LABORATORY TECHNIQUES, POST SECONDARY EDUCATION, SECONDARY EDUCATION, UNITS OF STUDY, WATER POLLUTION CONTROL, WATER RESOURCES, *WASTEWATER TREATMENT, *WATER TREATMENT
ERIC NO. ED153866
EDRS PRICE EDRS PRICE MF-$0.83 HC-$10.03 PLUS POSTAGE
DESC NOTE 195P.; FOR RELATED DOCUMENTS, SEE SE 024 249-254
ISSUE RIESEP78
ABSTRACT THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH THE BASIC CHEMICAL AND MICROBIOLOGICAL LABORARORY EQUIPMENT AND PROCEDURES USED IN WATER AND WASTEWATER TREATMENT PLANT LABORATORIES. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS AND TRANSPARENCY MASTERS. THIS MODULE CONSIDERS LAB SAFETY, BENCH SHEETS, LABELING, SAMPLING, SOLUTIONS, DILUTION TECHNIQUES, INCUBATORS, BALANCES, GLASSWARE, STANDARDIZATION, STANDARD CURVES, EQUIPMENT PACKAGING, AUTOCLAVES, MICROSCOPES AND ASEPTIC TECHNIQUES. (AUTHOR/RH)
INSTITUTION NAME KIRKWOOD COMMUNITY COLL., CEDAR RAPIDS, IOWA.

TITLE	BASIC SEWAGE TREATMENT OPERATION.
PUB DATE	NOV 76
AVAIL	PUBLICATIONS CENTRE, ONTARIO MINISTRY OF GOVERNMENT SERVICES, 880 BAY STREET, 5TH FLOOR, TORONTO, ONTARIO, CANADA M7A 1N8 ($2.00; ORDERS MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER PAYABLE TO "THE TREASURER OF ONTARIO")
DESC	*BEHAVIORAL OBJECTIVES, *ENVIRONMENTAL EDUCATION, ENVIRONMENTAL TECHNICIANS, JOB SKILLS, *POLLUTION, SAFETY, SAMPLING, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *WORKSHOPS, ONTARIO
ERIC NO.	ED155001
EDRS PRICE	EDRS PRICE MF-$0.83 PLUS POSTAGE. HC NOT AVAILABLE FROM EDRS.
DESC NOTE	247P.; FOR RELATED DOCUMENTS, SEE SE 024 227-233; NOT AVAILABLE IN HARD COPY DUE TO COPYRIGHT RESTRICTIONS; CONTAINS COLORED PAGES WHICH MAY NOT REPRODUCE WELL.
ISSUE	RIEOCT78
ABSTRACT	THIS MANUAL WAS DEVELOPED FOR USE AT WORKSHOPS DESIGNED TO INTRODUCE OPERATORS TO THE FUNDAMENTALS OF SEWAGE PLANT OPERATION. THE COURSE CONSISTS OF LECTURE-DISCUSSIONS AND HANDS-ON ACTIVITIES. EACH OF THE LESSONS HAS CLEARLY STATED BEHAVIORAL OBJECTIVES TO TELL THE TRAINEE WHAT HE SHOULD KNOW OR DO AFTER COMPLETING THAT TOPIC. AREAS COVERED IN THIS MANUAL INCLUDE: INTRODUCTION TO SEWAGE TREATMENT, BACTERIOLOGY, PRIMARY TREATMENT, ACTIVATED SLUDGE PROCESS, SAMPLING, AND RECORD KEEPING, SAFETY, AND SELECTED TESTS. A GLOSSARY OF TERMS IN INCLUDED FOR REFERENCE. (CS)

TITLE	BIOLOGICAL AND CHEMICAL WASTE TREATMENT EXPERIMENTS IN FAR NORTHERN SWEDEN
AUTHOR	BALMER, P.
AVAIL	IN: INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES, JULY 22-24, 1970, UNIVERSITY OF ALASKA, COLLEGE, P 252-262, 6 FIG, 6 TAB, 5 REF.
IDEN	*KIRUNA (SWEDEN), *CHEMICAL TREATMENT

KEYWORDS *BIOLOGICAL TREATMENT, *WASTE WATER TREATMENT, *ACTIVATED SLUDGE, TEMPERATURE, BACTERIA, *AERATION, FLOCCULATION, COSTS, COLD REGIONS, CHEMICAL PRECIPITATION, PHOSPHORUS, SUSPENDED SOLIDS, SLUDGE, PILOT PLANTS, SEWAGE, RECIRCULATED WATER, SETTLING BASINS, HYDROGEN ION CONCENTRATION, EFFLUENTS

ABSTRACT LABORATORY DATA SHOW THAT THE METABOLIZING ACTIVITY OF ACTIVATED SLUDGE IS SERIOUSLY HAMPERED AT LOW TEMPERATURES, AND BOD REDUCTION DATA IN ACTIVATED SLUDGE SYSTEMS AT LOW TEMPERATURES ARE PARTLY CONTRADICTORY. PILOT PLANT EXPERIMENTS WERE CONDUCTED WITH ACTIVATED SLUDGE AND CHEMICAL TREATMENT. THE ACTIVATED SLUDGE TREATMENT PROVED THAT BIOLOGICAL TREATMENT IS POSSIBLE EVEN AT VERY LOW SEWAGE TEMPERATURES. AS THE METABOLIZING ACTIVITY OF THE ACTIVATED SLUDGE BACTERIA IS CONSIDERABLY REDUCED, LONG AERATION PERIODS, 4-5 HOURS, AND LARGE AERATION BASINS, ARE REQUIRED. CHEMICAL TREATMENT IS MUCH LESS SENSITIVE TO LOW TEMPERATURES AND REQUIRES ONLY ABOUT 0.5 HOUR DETENTION TIME IN FLOCCULATION TANKS. DIFFERENCE IN INVESTMENT COSTS WILL IN MANY INSTANCES BE SO LARGE THAT THE INCREASED RUNNING COSTS ARE JUSTIFIED. IF A COMMUNITY HAS AN EXISTING PRIMARY TREATMENT PLANT WITH A LONG DETENTION TIME (MORE THAN 2 HOURS), IT MAY BE POSSIBLE TO ACHIEVE A SUBSTANTIAL INCREASE IN TREATMENT EFFICIENCY SIMPLY ADDING FLOCCULATING CHEMICALS TO THE INFLUENT. BOD REMOVAL WITH CHEMICAL TREATMENT IS SOMEWHAT INFERIOR TO WHAT CAN BE ACHIEVED WITH BIOLOGICAL TREATMENT. THIS DRAWBACK, HOWEVER, IS COMPENSATED BY SUPERIOR PHOSPHORUS REMOVAL. (SEE ALSO W72-12548) (JONES-WISCONSIN)

TITLE BIOMASS DETERMINATION - A NEW TECHNIQUE FOR ACTIVATED SLUDGE CONTROL.

CORP AUTH BIOSPHERICS INC., ROCKVILLE, MD.

AVAIL COPY AVAILABLE FROM GPO SUP DOC EPA 17050 EOY 01/72, $1.25; MICROFICHE FROM NTIS AS PB-211 127, $0.95. ENVIRONMENTAL PROTECTION AGENCY, WATER POLLUTION CONTROL RESEARCH SERIES, NO 17050 EOY. JANUARY 1972, 116 P, 53 FIG, 22 TAB, 18 REF, EPA PROGRAM 17050 EOY 01/72.

IDEN *ATP, *PROCESS CONTROL, *ADENOSINE TRIPHOSPHATE

KEYWORDS *ACTIVATED SLUDGE, *ANALYTICAL TECHNIQUES, *WATER QUALITY, *CONTROL, MONITORING, SUSPENDED SOLIDS, *BIOMASS, SEPARATION TECHNIQUES, LABORATORY TESTS, PILOT PLANTS, ON-SITE INVESTIGATIONS, *WASTE WATER TREATMENT

ABSTRACT RESEARCH WAS CONDUCTED TO DETERMINE THE FEASIBILITY OF USING ADENOSINE TRIPHOSPHATE (ATP) AS A MEASURE OF VIABLE BIOMASS IN ACTIVATED SLUDGE. METHODS WERE DEVELOPED FOR THE EXTRACTION OF ATP FROM SLUDGE AND MIXED LIQUOR, AND FOR THE DETERMINATION OF ATP USING THE FIREFLY BIOLUMINESCENT PROCEDURE. MEASUREMENTS OF ATP WERE CONDUCTED ON VARIOUS PURE CULTURES, PILOT PLANT AND FULL-SCALE ACTIVATED SLUDGE TREATMENT PLANTS. ADDITIONAL PARAMETERS INCLUDING BOD, TOC, OXYGEN UPTAKE RATE, AND SUSPENDED SOLIDS WERE MEASUREED TO PROVIDE COMPARATIVE AND SUPPORTIVE INFORMATION. PRELIMINARY TESTS IN WHICH ATP MEASUREMENTS OF BIOMASS WERE USED TO CONTROL THE PERCENT SLUDGE RETURN WERE CONDUCTED AT TWO FULL-SCALE MUNICIPAL SEWAGE TREATMENT PLANTS. LOWERED RETURN SLUDGE RATES WERE FOUND TO PRODUCE EFFECTIVE TREATMENT AND INCREASE THE BIOLOGICAL ACTIVITY OF THE SLUDGE. CHANGES IN THE RATE OF RETURN SLUDGE RESULTED IN CHANGES IN ATP CONCENTRATION OF MIXED LIQUOR WHICH PRECEDED CHANGES IN SUSPENDED SOLIDS BY AS MUCH AS 24 HOURS. THE ASSAY WAS FOUND TO BE REPRODUCIBLE AND RAPID, RESULTS CAN BE OBTAINED WITHIN APPROXIMATELY TEN MINUTES. (LOWRY-TEXAS)

TITLE COMPARATIVE EVALUATION OF SEQUENCING BATCH REACTORS

AUTHOR IRVINE, R. L.; RICHTER, R. O.

CORP AUTH NOTRE DAME UNIV., IN. DEPT OF CIVIL ENGINEERING

PUB DESC JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, VOL 104, NO EE3, PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, P 503-514, JUNE 1978. 3 FIG, 4 TAB, 15 REF.

KEYWORDS *ACTIVATED SLUDGE, *BATCH REACTORS, *SEQUENCING, *SEWAGE TREATMENT, *COMPUTER MODELS, *SIMULATION ANALYSIS, WASTE WATER (POLLUTION), MASS BALANCE EQUATIONS, FLOW, DESIGN, PERIODIC VARIATIONS, OPERATIONS RESEARCH

134

ABSTRACT THE PERFORMANCE OF MANY PROCESSES AND OPERATIONS CAN BE IMPROVED APPRECIABLY BY THE CONTROLLED UNSTEADY OPERATIONS THAT ARE PROVIDED BY SEQUENCING BATCH (FILL AND DRAW) BIOLOGICAL REACTORS. THE LACK OF DESIGN AND OPERATION EXPERIENCE IN BATCH TREATMENT HAS RESULTED IN AN EXPERIENCE VOID THAT HAS FOSTERED THE SELECTION OF CONTINUOUS FLOW RATHER THAN BATCH TREATMENT SCHEMES. SYSTEM SELECTION SHOULD DEPEND INSTEAD UPON SUITABILITY OF THE SYSTEM, RELIABILITY, EFFICIENCY, CONSISTENCY, AND ECONOMIC. BENCH, PILOT, AND FULL-SCALE INVESTIGATIONS, AND DESK TOP AND COMPUTER ANALYSES MUST SUPPLEMENT EXISTING BENCH SCALE STUDIES IF THE EXPERIENCE VOID IS TO BE FILLED. SEVERAL HYPOTHETICAL EXAMPLES ARE USED TO PARTIALLY FILL THE VOID BY COMPARING VOLUMES FOR BOTH THE BATCH AND CONTINUOUS FLOW SYSTEMS. IN THE EXAMPLES, SEQUENCING BATCH TREATMENT PROVIDES THE POTENTIAL FOR ACHIEVING EFFLUENT LIMITATIONS IN A TOTAL VOLUME NOTABLY LESS THAN THAT FOR A CONVENTIONAL CONTINUOUS FLOW SYSTEM. THIS ADDS TO PREVIOUSLY RECOGNIZED ADVANTAGES THAT INCLUDE HOLDING A WASTE UNTIL A PROPER TREATMENT IS ACHIEVED. THE COMPUTER SIMULATIONS HEREIN HAVE SHOWN HOW THE DESIGN VOLUME FOR A SEQUENCING BATCH SYSTEM DIFFERED AS A FUNCTION OF THE RELATIVE VARIABILITY OF THE MASS FLOW RATE EVEN THOUGH THE AVERAGE MASS FLOW RATE WAS THE SAME FOR ALL CASES INVESTIGATED. (GRAF-CORNELL)

TITLE CONTACT STABILIZATION IN SMALL PACKAGE PLANTS
AUTHOR DAGUE, R. R.; ELBERT, G. F.; ROCKWELL, M. D.
CORP AUTH IOWA UNIV., IOWA CITY.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 44, NO 2, FEBRUARY 1972, P 255-264, 11 FIG, 3 TAB, 6 REF.
IDEN *CONTACT STABILIZATION, *PACKAGE PLANTS
KEYWORDS *ACTIVATED SLUDGE, *DESIGN CRITERIA, *ON-SITE INVESTIGATIONS, AERATION, RESPIRATION, ABSORPTION, ADSORPTION, MIXING, BIODEGRADATION, ORGANIC LOADING, BIOCHEMICAL OXYGEN DEMAND, SUSPENDED SOLIDS, WASTE WATER TREATMENT
ABSTRACT INVESTIGATION WITH CONTACT STABILIZATION PACKAGE TREATMENT PLANTS AS CURRENTLY DESIGNED HAS DEMONSTRATED THAT SUCH FACILITIES ARE UNSTABLE UNDER CONDITIONS OTHER THAN 24 HOUR OPERATION. TWO CONTACT STABILIZATION PLANTS CURRENTLY HAVING OPERATIONAL DIFFICULTIES WERE MODIFIED, ONE TO THE CONVENTIONAL ACTIVATED SLUDGE PROCESS AND THE

OTHER TO COMPLETE MIX OPERATION. THE DIFFICULTIES ENCOUNTERED BY THE CONTACT STABILIZATION STEMMED MAINLY FROM FLOW VARIATIONS, AND THE FACT THAT MOST PLANTS ARE DESIGNED FOR A 3-HOUR CONTACT TIME RATHER THAN THE 15 TO 30 MIN. CONTACT TIME ORIGINALLY DEVELOPED. THE WIDE VARIABILITY OF THE MUNICIPAL WASTE FLOW FOR THE FIRST SYSTEM EVALUATED CAUSED THE WASTES IN THE CONTACT ZONE TO HAVE A RETENTION TIME VARYING FROM 2 TO 8 HOURS. EACH OF THE OTHER PLANT OPERATIONS WAS SIMILARLY AFFECTED. THE TROUBLE WHICH AROSE THEN, WAS MAINLY IN SEPARATING THE SOLIDS FROM THE EFFLUENT, WHICH BECAME NEARLY IMPOSSIBLE. AFTER MODIFICATION, THE TWO PLANTS FUNCTIONED EXTREMELY WELL, PRODUCING EFFLUENTS OF 13 MG/L OR LESS OF BOD AND 12 MG/L OR LESS OF SUSPENDED SOLIDS. (LOWRY-TEXAS)

TITLE THE DESIGN, CONSTRUCTION, AND OPERATION OF EXTENDED-AERATION PLANTS.
AUTHOR STORCH, B.
CORP AUTH PETERS, G. D. (ENGINEERING) LTD.
AVAIL WATER POLLUTION CONTROL, VOL 68, NO 1, P 40-50, JAN-FEB 1969, 4 REF.
IDEN *EXTENDED AERATION, AEROBIC DIGESTION
KEYWORDS *ACTIVATED SLUDGE, *OPERATION AND MAINTENANCE, *DESIGN, *CONSTRUCTION, AERATION, WASTE WATER TREATMENT, AEROBIC CONDITIONS
ABSTRACT THE DESIGN OF AN EXTENDED AERATION PLANT IS DISCUSSED INCLUDING: INLET, AERATION TANK, AERATION TO SETTLING TRANSFER, INLET TO SETTLING TANKS, SETTLING TANK, SLUDGE RETURN, SURFACE SKIMMING, EFFLUENT WITHDRAWAL, AND EXCESS SLUDGE HANDLING. EXCESS SLUDGE HANDLING IS TREATED AT LENGTH INCLUDING AEROBIC DIGESTION. PHYSICAL DESCRIPTIONS AND RECOMMENDED DIMENSIONS FOR VARIOUS COMPONENTS AND EQUATIONS FOR SEVERAL CALCULATIONS ARE GIVEN. RECOMMENDATIONS ARE MADE FOR MATERIALS TO BE USED, POSITIONING OF EQUIPMENT AND OTHER FACETS OF CONSTRUCTION. PLANT START-UP IS DESCRIBED AND A CHECKLIST FOR OPERATION AND MAINTENANCE IS GIVEN. (DIFILIPPO-TEXAS)

TITLE DESIGN PROCEDURES FOR DISSOLVED OXYGEN CONTROL OF ACTIVATED SLUDGE PROCESSES
AUTHOR FLANAGAN, M. J.; BRACKEN, B. D.
CORP AUTH BROWN AND CALDWELL, WALNUT CREEK, CA
PUB DESC AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-270 960, IN

PAPER COPY, IN MICROFICHE, REPORT NO. EPA-600/2-77-032, JUNE, 1977. 217 P, 86 FIG, 31 TAB, 47 REF, 1 APPENDX 68-2130.

KEYWORDS *DISSOLVED OXYGEN, *ACTIVATED SLUDGE, *SLUDGE TREATMENT, *AERATION, *AUTOMATION, *COST ANALYSIS, ECONOMICS, COSTS, OPERATING COSTS, CAPITAL COSTS, MAINTENANCE COSTS, MANUAL CONTROL, AUTOMATIC CONTROL, CONTROL SYSTEMS, EQUIPMENT, PERFORMANCE, OPERATIONS, DESIGN, MAINTENANCE, APPLICATION METHODS, WASTE WATER TREATMENT, WASTE TREATMENT, SEWAGE TREATMENT, WATER PURIFICATION, INSTRUMENTATION, *AERATION EQUIPMENT, *ACTIVATED SLUDGE TREATMENT PLANTS, *COST EFFECTIVENESS, ECONOMIC ANALYSIS, MANUAL DISSOLVED OXYGEN CONTROL, AUTOMATIC DISSOLVED OXYGEN CONTROL, CONTROL EQUIPMENT.

ABSTRACT DESIGN PROCEDURES AND GUIDELINES FOR THE SELECTION OF AERATION EQUIPMENT AND DISSOLVED OXYGEN (DO) CONTROL SYSTEMS FOR ACTIVATED SLUDGE TREATMENT PLANTS ARE PRESENTED. PROCESS CONFIGURATIONS AND DESIGN PARAMETERS ARE REVIEWED TO ESTABLISH SYSTEM REQUIREMENTS. AERATION METHODS, EQUIPMENT AND APPLICATION TECHNIQUES, DESIGN SYSTEMS, AND CONTROL SYSTEM SELECTION PROCEDURES ARE EXAMINED. RECOMMENDATIONS FOR SYSTEM APPLICATIONS TO VARIOUS AERATION EQUIPMENT TYPES AND PROCESS CONFIGURATIONS ARE DESCRIBED. PERFORMANCE, OPERATIONAL AND MAINTENANCE DATA FOR AERATION EQUIPMENT AND DO CONTROL SYSTEMS FOR 12 ACTIVATED SLUDGE PLANTS ARE PRESENTED IN THE APPENDIX. AUTOMATIC DO CONTROL SYSTEMS FOR VARIOUS SIZE HYPOTHETICAL ACTIVATED SLUDGE SYSTEM CONFIGURATIONS ARE PRESENTED TO DEVELOP AN ECONOMIC ANALYSIS MANUAL AND AUTOMATIC DO CONTROL. CONCLUSIONS INDICATE THAT CAPITAL AND OPERATING COSTS OF AUTOMATIC DO CONTROL SYSTEMS ARE JUSTIFIED FOR ACTIVATED SLUDGE PLANTS LARGER THAN 1 MGD (44 DM3/S) ONLY IF EQUIPMENT IS SELECTED AND APPLIED IN ACCORDANCE WITH GUIDELINES OF THE DESIGN MANUAL AND A POWER COST IS APPLICABLE WHICH IS EQUAL TO OR GREATER THAN THE NATIONAL AVERAGE POWER RATE. AREAS IN WHICH FURTHER RESEARCH IS INDICATED ARE DISCUSSED. (SEIP-IPA)

TITLE DISSOLVED OXYGEN ANALYSIS - ACTIVATED SLUDGE CONTROL TESTING (XT-43).

AUTHOR LUDZACK, F. J.

PUB DATE JUN 71

DESC *AUDIOVISUAL AIDS, *CHEMICAL ANALYSIS, *CHEMISTRY, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, POLLUTION, *POST SECONDARY EDUCATION, SCIENCE EDUCATION, WATER POLLUTION CONTROL, *OXYGEN, WASTEWATER TREATMENT, DISSOLVED OXYGEN, *ACTIVATED SLUDGE

DESC NOTE INCLUDED IS A 34 MINUTE TAPE, 72 SLIDES, AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W ST. CLAIR, CINCINNATI, OHIO 45268

ABSTRACT THIS MODULE IS DESIGNED FOR ADVANCED WASTEWATER TREATMENT PLANT OPERATORS OR PLANT CONTROL SUPERVISORS. RAPID AND VALID TECHNIQUES ARE DESCRIBED FOR CONTROL OF THE ACTIVATED SLUDGE TREATMENT PROCESS USING ELECTRONIC MEASUREMENT OF DO AND DO CHANGES. SAMPLE DATA ARE DISCUSSED FOR INTERPRETATION OF SLUDGE CONDITION IN RESPONSE TO STABILIZATION, FEED, LOAD RATIO OR CONDITIONS. INFORMATION OBTAINABLE WITHIN 20 MINUTES PROVIDES SUGGESTED CORRECTIVE ACTION IN TIME TO UPGRADE EFFLUENT QUALITY. (AUTHOR/JK)

TITLE DYNAMIC MODELING AND CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE PROCESS.

AUTHOR BUSBY, J. B.; ANDREWS, J. F.

CORP AUTH CLEMSON UNIV., S.C. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING; AND ENVIRONMENTAL DYNAMICS, INC.,GR.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 47, NO 5, P 1055-1080, MAY 1975. 22 FIG, 3 TAB, 23 EQU, 45 REF.

IDEN *PROCESS CONTROL, DYNAMIC MODELS, FEEDING, STEP-FEED PROCESS, RATIO CONTROL.

KEYWORDS *ACTIVATED SLUDGE, *WASTE WATER TREATMENT, *WATER QUALITY, *SIMULATION ANALYSIS, BIOLOGICAL TREATMENT, WASTES, COMPUTERS, SUSPENDED SOLIDS, SYSTEMS ANALYSIS, MATHEMATICAL MODELS, RECYCLING.

ABSTRACT CONVENTIONAL ACTIVATED SLUDGE PROCESSES MAY BE CONTROLLED BY SLUDGE RECYCLE RATE, WASTE SLUDGE FLOW RATE, AND AERATION RATE. IN A MULTISTAGE REACTOR SYSTEM SUCH AS THE STEP-FEED PROCESS, VARIATIONS IN WASTEWATER FEED PATTERNS ARE ANOTHER CONTROL TECHNIQUE. A WIDE-SPECTRUM ACTIVATED SLUDGE PROCESS MODEL WAS DEVELOPED THAT CONSIDERS THE STORAGE CAPABILITY OF THE SLUDGE, INCORPORATES THE ACTIVE AND INERT FRACTIONS OF THE MIXED LIQUOR VOLATILE SUSPENDED SOLIDS IN SEPARATE MASS BALANCES, AND IS COUPLED WITH A DYNAMIC MODEL OF THE FINAL CLARIFIER. CONTROL STRATEGIES INVESTIGATED INCLUDE VARIOUS SLUDGE WASTING AND RECYCLE CONTROL TECHNIQUES AND HYDRAULIC METHODS.

COMPUTER SIMULATION RESULTS INDICATE THAT THE MODEL SATISFACTORILY DESCRIBES THE DIFFERENT PROCESS VERSIONS AND THAT DYNAMIC VARIATIONS IN WASTEWATER FEED PATTERN ARE VALUABLE FOR CONTROL. (BELL-CORNELL)

TITLE EFFECTS OF FLOW EQUALIZATION ON THE OPERATION AND PERFORMANCE OF AN ACTIVATED SLUDGE PLANT.
AUTHOR FOESS, G. W.; AND OTHERS
PUB DATE AUG 77
AVAIL NTIS, 5285 PORT ROYAL RD., SPRINGFIELD, VA 22161 ($6.50)
DESC *ACTIVATED SLUDGE, CHEMICAL OXYGEN DEMAND, *FLOW MEASUREMENT, RESEARCH REPORTS, SEWAGE, *SLUDGE, *WASTEWATER TREATMENT, *COST EFFECTIVENESS, *OPERATIONS (WASTEWATER)
DESC NOTE 110P ORDER NO. PB 272 657
ABSTRACT A PLANT-SCALE RESEARCH PROGRAM WAS CARRIED OUT OVER A YEAR TO EVALUATE THE IMPACT OF FLOW EQUALIZATION OF THE 14,000 CU.M/DAY (3.7 MGD) UPGRADED ACTIVATED SLUDGE PLANT AT YPSILANTI TOWNSHIP, MICHIGAN. PROCESS STEAMS WERE CHARACTERIZED UNDER BOTH EQUALIZED AND UNEQUALIZED FLOW CONDITIONS WITH RESPECT TO BOD, COD, TSS AND FORMS OF NITROGEN AND PHOSPHORUS. THE EQUALIZATION SYSTEM WAS EFFECTIVE IN ITS ABILITY TO DAMPEN VARIATIONS IN WASTEWATER CONCENTRATION AND MASS FLUX. SOME BIOCHEMICAL ACTION APPARENTLY OCCURRED IN THE EQUALIZATION BASIN, ALTHOUGH BOD REMOVAL WAS MARGINAL AND INCONSISTENT. ANALYSIS OF SECONDARY EFFLUENT INDICATED THAT PLANT PERFORMANCE WAS SIMILAR WITH AND WITHOUT EQUALIZED FLOW, SUGGESTING THAT THE THEORETICAL ADVANTAGES OF FLOW EQUALIZATION MAY NOT BE ACHIEVED IN MANUALLY CONTROLLED PLANTS. AN EXAMINATION OF THEORETICAL POWER COSTS FOR EQUALIZED AND UNEQUALIZED FLOW CONDITIONS INDICATED THAT USE OF FLOW EQUALIZATION DID NOT RESULT IN POWER COST ECONOMIES. (BB)

TITLE EFFLUENT MONITORING PROCEDURES: BASIC PARAMETERS FOR MUNICIPAL EFFLUENTS. STAFF GUIDE.
PUB DATE 77
DESC CHEMISTRY, COURSE DESCRIPTIONS, *EDUCATIONAL PROGRAMS, ENVIRONMENTAL EDUCATION, *INSTRUCTIONAL MATERIALS, *LABORATORY TECHNIQUES, MICROBIOLOGY, *POLLUTION, POST SECONDARY EDUCATION, SKILL DEVELOPMENT, *WATER POLLUTION CONTROL, *WASTEWATER TREATMENT, *EFFLUENTS, *MONITORING

ERIC NO. ED147194
EDRS PRICE EDRS PRICE MF-$0.83 HC-$16.73 PLUS POSTAGE.
DESC NOTE 315P.; FOR RELATED DOCUMENTS, SEE SE 023 377-383; AS NOTED IN THE TABLE OF CONTENTS, SECTIONS 18 AND 27 ARE NOT INCLUDED IN THE PAGINATION
ISSUE RIEAPR78
ABSTRACT THIS IS ONE OF SEVERAL SHORT-TERM COURSES DEVELOPED TO ASSIST IN THE TRAINING OF WASTE WATER TREATMENT PLANT OPERATIONAL PERSONNEL IN THE TESTS, MEASUREMENTS, AND REPORT PREPARATION REQUIRED FOR COMPLIANCE WITH THEIR NPDES PERMITS. THIS STAFF GUIDE PROVIDES STEP-BY-STEP GUIDELINES ON COURSE PLANNING, DEVELOPMENT AND IMPLEMENTATION INVOLVING CLASSROOM INSTRUCTION AND LABORATORY APPLICATION OF CRITICAL LEARNING OUTCOMES. PART I IS CONCERNED WITH THE ADMINISTRATIVE ASPECTS OF THE TRAINING PROGRAM, PART II CONSISTS OF INSTRUCTIONAL STAFF GUIDELINES ON TECHNICAL CONTENT, LEARNING OBJECTIVES, AND LESSON-BY-LESSON GUIDES FOR THE SELF-MONITORING PROCEDURES CONTAINED IN THIS COURSE. INCLUDED IN THIS DOCUMENT ARE MATERIALS RELATED TO DETERMINING DISSOLVED OXYGEN, PH, FECAL COLIFORM, WATER FLOW, SUSPENDED SOLIDS, AND CHLORINE. (CS)

TITLE EFFLUENT MONITORING PROCEDURES: NUTRIENTS. STAFF GUIDE.
PUB DATE 77
DESC COURSE DESCRIPTIONS, *EDUCATIONAL PROGRAMS, ENVIRONMENTAL EDUCATION, *INSTRUCTIONAL MATERIALS, *LABORATORY TECHNIQUES, *POLLUTION, POST SECONDARY EDUCATION, SKILL DEVELOPMENT, TEACHING METHODS, *WATER POLLUTION CONTROL, *WASTEWATER TREATMENT, *EFFLUENTS, *MONITORING, *NUTRIENTS
EDRS PRICE EDRS PRICE MF-$0.83 HC-$12.71 PLUS POSTAGE
DESC NOTE 247P., FOR RELATED DOCUMENTS, SEE SE 023 377-383, SOME PAGES MAY REPRODUCE POORLY DUE TO PRINT QUALITY.
ISSUE RIEAPR78
ABSTRACT THIS IS ONE OF SEVERAL SHORT-TERM COURSES DEVELOPED TO ASSIST IN THE TRAINING OF WASTE WATER TREATMENT PLANT OPERATIONAL PERSONNEL IN THE TESTS MEASUREMENTS, AND REPORT PREPARATION REQUIRED FOR COMPLIANCE WITH THEIR NPDES PERMITS. THIS STAFF GUIDE PROVIDES STEP-BY-STEP GUIDELINES ON COURSE PLANNING, DEVELOPMENT AND IMPLEMENTATION INVOLVING CLASSROOM INSTRUCTION AND LABORATORY APPLICATION OF CRITICAL LEARNING OUTCOMES. PART I IS CONCERNED WITH THE ADMINISTRATIVE ASPECTS OF THE TRAINING

PROGRAM. PART II CONSISTS OF INSTRUCTIONAL STAFF GUIDELINES ON TECHNICAL CONTENT, LEARNING OBJECTIVES, AND LESSON-BY-LESSON GUIDES FOR THE SELF-MONITORING PROCEDURES CONTAINED IN THIS COURSE. INCLUDED ARE A VARIETY OF TECHNIQUES FOR DETERMINING VARIOUS MATERIALS IN WATER INCLUDING PHOSPHORUS, NITROGEN, AMMONIA, CADMIUM, OIL, AND GREASE. (CS)

TITLE FACILITIES FOR CONTROLLING THE ACTIVATED SLUDGE PROCESS BY MEAN CELL RESIDENCE TIME
AUTHOR BURCHETT, M.E.; TCHOBANDOGLOUS, G.
CORP AUTH YODER-TROTTER-ORLOB AND ASSOCIATES, WALNUT CREEK, CALIF.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 46, NO 5, P 973-979, MAY 1974. 7 FIG, 6 REF.
IDEN *MEAN CELL RESIDENCE TIME.
KEYWORDS *ACTIVATED SLUDGE, *TREATMENT FACILITIES, *CONTROL SYSTEMS, AUTOMATIC CONTROL, OPERATION AND MAINTENANCE, *WASTE WATER TREATMENT
ABSTRACT SEVERAL METHODS NOW BEING USED BY OPERATORS TO CONTROL THE ACTIVATED SLUDGE PROCESS ARE DISCUSSED. THE USE OF THE MEAN CELL RESIDENCE TIME (MCRT) IS RECOMMENDED AS THE MOST SUITABLE OPERATIONAL CONTROL PARAMETER. THE BASIC CONCEPTS INVOLVING THE THEORETICAL AND PRACTICAL REASONS FOR CONTROLLING THE MCRT ARE DISCUSSED. THE PHYSICAL FEATURES OF A CONTROL SYSTEM DEVELOPED TO USE THIS METHOD ARE PRESENTED. THE FOLLOWING ADVANTAGES FOR THE PROPOSED CONTROL SYSTEM ARE: MINIMUM REQUIRED OPERATOR ATTENTION, INEXPENSIVE CAPITAL COSTS, MORE POSITIVE PROCESS CONTROL, AND MORE STABLE PROCESS OPERATION. (BA

TITLE GET THE MOST FROM THE FINAL CLARIFIERS.
AUTHOR BOYLE, W. H.
CORP AUTH ENVIREX INC., WAUKESHA, WIS.
AVAIL WATER AND WASTES ENGINEERING, VOL 12, NO 10, P 53-55, 82, OCTOBER, 1975. 4 FIG.
IDEN *CLARIFIERS, HYDRAULIC REMOVAL MECHANISMS, SLUDGE RETURN.
KEYWORDS *WASTE WATER TREATMENT, *ACTIVATED SLUDGE, HYDRAULIC MACHINERY, HYDRAULICS, SLUDGE, DESIGN.
ABSTRACT THE FINAL CLARIFIER PERFORMS ONE OF THE MOST IMPORTANT UNIT FUNCTIONS IN THE ACTIVATED SLUDGE PROCESS. THE HYDRAULIC REMOVAL MECHANISM, SOMETIMES CALLED A VACUUM OR SUCTION TYPE DEVICE, IS THE PREFERRED SLUDGE COLLECTION MECHANISM WHEN DEALING WITH A LIGHT FLOCCULANT SLUDGE. A BRIEF

REVIEW IS PRESENTED OF THE MAIN REQUIREMENTS FOR A HYDRAULIC REMOVAL MECHANISM WHICH ARE RAPID SLUDGE REMOVAL, MINIMUM SLUDGE AGITATION, MAXIMUM SOLIDS CONCENTRATION, FLEXIBILITY, AND BALANCED HYDRAULIC DESIGN. ONE OF THE TWO MAIN TYPES OF CIRCULAR HYDRAULIC REMOVAL MECHANISMS IS A RECTANGULAR TAPERED HEADER MADE OF 0.25 INCH STEEL PLATE WITH ORIFICES DRILLED INTO THE HEADER FOR THE REMOVAL OF SLUDGE (THE HEADER DESIGN). THE OTHER DEVICE INCORPORATES SEVERAL WITHDRAWAL PIPES WITH THE SLUDGE CHANNELED BY DEFLECTOR PLATES TO THESE PIPES AND TRANSPORTED TO COLLECTION WELLS (RISER PIPE DESIGN). THE HYDRAULIC DESIGN OF EACH OF THESE DEVICES IS EXPLAINED. CHOICE OF HYDRAULIC SLUDGE REMOVAL MECHANISM SHOULD BE BASED ON PERFORMANCE, HOW THE DEVICE AFFECTS THE MAIN PROCESS REQUIREMENTS, AND AN ECONOMIC EVALUATION OF CAPITAL AND OPERATIONAL/MAINTENANCE EXPENDITURES. (ORR-FIRL)

TITLE GUIDE TO WASTEWATER TREATMENT: BIOLOGICAL-SYSTEM DEVELOPMENTS.

AUTHOR FORD, D. L.; TISCHLER, L. F.

CORP AUTH ENGINEERING-SCIENCE, INC., AUSTIN, TX.

AVAIL CHEMICAL ENGINEERING, VOL 84, NO 17, P 131-135, AUGUST, 1977. 2 FIG. 13 REF.

KEYWORDS *BIOLOGICAL TREATMENT, *INDUSTRIAL WASTES, *ACTIVATED SLUDGE, *TRICKLING FILTERS, *BIODEGRADATION, EQUALIZING RESERVOIRS, ORGANIC LOADING, DILUTION, SOLVENT EXTRACTIONS, SUSPENDED SOLIDS, DESIGN CRITERIA, NITRIFICATION, FILTRATION, *WASTE WATER TREATMENT

ABSTRACT HIGH-RATE BIOLOGICAL TREATMENT SYSTEMS SUCH AS ACTIVATED SLUDGE, TRICKLING FILTERS, AND ROTATING DISCS ARE REVIEWED FOR USE IN MUNICIPAL AND INDUSTRIAL WASTE WATER TREATMENT. VARIOUS ASPECTS OF SUSPENDED-GROWTH SYSTEMS SUCH AS THE COMPLETELY-MIXED ACTIVATED SLUDGE PROCESS ARE DISCUSSED, INCLUDING CONTACT STABILIZATION, SOLIDS REMOVAL, AND EFFLUENT POLISHING. FIXED-GROWTH SYSTEMS SUCH AS THE CONVENTIONAL TRICKLING FILTER AND THE ROTATING BIOLOGICAL FILTER ARE DESCRIBED AND COMPARED WITH SUSPENDED-GROWTH SYSTEMS. FLOW EQUALIZATION AND AUXILIARY BASINS IN INDUSTRIAL WASTE WATER TREATMENT ARE SUGGESTED TO OFFSET PROBLEMS ASSOCIATED WITH HYDRAULIC- AND ORGANIC-LOAD VARIATIONS TO BIOLOGICAL SYSTEMS. PRETREATMENT WITH HYDROLYSIS IS SUGGESTED TO ENHANCE BIODEGRADABILITY. PRE-DILUTION OF INFLUENT

142

STREAMS HAVING HIGH ORGANIC CONCENTRATIONS BY STREAMS HAVING LOW ORGANIC CONCENTRATIONS IS SUGGESTED TO IMPROVE OVERALL PERFORMANCE OF A BIOLOGICAL SYSTEM. STEAM OR SOLVENT STRIPPING OF INDUSTRIAL WASTE STREAMS IS RECOMMENDED TO REDUCE HIGH-ORGANIC LOADS, MINIMIZE LOADING VARIATIONS, AND REDUCE INHIBITION OF BIOLOGICAL PROCESSES BY PARTICULARLY TOXIC WASTES. INCREASING THE AMOUNT OF BIOLOGICAL SOLIDS IN THE AERATION BASIN OF SUSPENDED GROWTH SYSTEMS BY INCREASING THE SLUDGE-RECYCLE RATIO AND/OR REDUCING SLUDGE WASTAGE IS REPORTED TO PREVENT BIOLOGICAL UPSET. VARIOUS PROCESSES USED IN THE REMOVAL OF SECONDARY SOLIDS ARE DISCUSSED. DESIGN AND OPERATIONAL VARIABLES WHICH CAN AFFECT PROCESS PERFORMANCE ARE DISCUSSED, INCLUDING SLUDGE AGE, TEMPERATURE, SLUDGE BULKING, NITRIFICATION, AND ACTIVATED CARBON TREATMENT. ((SCHULZ-FIRL)

TITLE HANDBOOK FOR WATER AND WASTEWATER ANALYSIS.
PUB DATE 76
AVAIL VWR SCIENTIFIC, PO BOX 3200, SAN FRANCISCO, CA 94119
DESC *ANALYTICAL TECHNIQUES, CHEMICAL ANALYSIS, *INSTRUCTIONAL MATERIALS, *LABORATORY TECHNIQUES, *MANUALS, POST SECONDARY EDUCATION, *WATER ANALYSIS
ABSTRACT ANALYTICAL TECHNIQUES FOR USE IN WATER AND WASTEWATER LABORATORIES.

TITLE HANDBOOK OF ADVANCED WASTEWATER TREATMENT, 2ND EDITION
AUTHOR CULP, RUSSELL L.; AND OTHERS
PUB DATE 78
AVAIL VAN NOSTRAND/REINHOLD CO., 300 PIKE ST., CINCINNATI, OH 45202
DESC CARBON DIOXIDE, *CHEMISTRY, CHLORINATION, DEMINERALIZATION, *DISINFECTION, *ECONOMICS, FILTRATION, FLOCCULATION, *HIGHER EDUCATION, *INSTRUCTIONAL MATERIALS, *LAND APPLICATION, *OPERATIONS (WASTEWATER), POST SECONDARY EDUCATION, *SLUDGE, WASTEWATER SLUDGE, *WASTEWATER TREATMENT, *WATER POLLUTION CONTROL
DESC NOTE 632P.
ABSTRACT INCLUDED IN THIS BOOK ARE CHAPTERS ON THE PURPOSE AND BENEFITS OF ADVANCED WASTEWATER TREATMENT, CHEMICAL CLARIFICATION, RECARBONATION, FILTRATION, ACTIVATED CARBON ADSORPTION AND REGENERATION, DISINFECTION, NITROGEN REMOVAL, CHEMICAL SLUDGE

HANDLING, DEMINERALIZATION, LAND TREATMENT OF WASTEWATERS, ESTIMATING THE COSTS OF WASTEWATER TREATMENT FACILITIES AND SELECTING AND COMBINING UNIT PROCESSES. SOME OF THE TOPICS INCLUDED ARE: (1) COAGULATION, FLOCCULATION, AND SEDIMENTATION; (2) SINGLE STAGE VS, TWO STAGE CARBONATION; (3) DESIGN OF FILTER SYSTEMS; (4) EVALUATION OF ACTIVATED CARBON; (5) CHLORINATION; (6) BIOLOGICAL NITROGEN REMOVAL; (7) ELECTRODIALYSIS; AND (8) ION EXCHANGE. THIS BOOK CONTAINS DESIGN EXAMPLES AND CASE HISTORIES OF OPERATING PLANTS. IT IS USEFUL AS A REFERENCE BOOK, OR A TEXT IN GRADUATE OR UNDERGRADUATE ENVIRONMENTAL ENGINEERING COURSES. (BB)

TITLE THE IMPACT OF OILY MATERIAL ON ACTIVATED SLUDGE SYSTEMS.

CORP AUTH HYDROSCIENCE, INC., WESTWOOD, N.J.

AVAIL COPY AVAILABLE FROM GPO SUP DOC AS SN5501-0088, $1.25; MICROFICHE FROM NTIS AS PB-212 422, $0.95. ENVIRONMENTAL PROTECTION AGENCY, WATER POLLUTION CONTROL RESEARCH SERIES, MARCH 1971, 110 P, 29 FIG, 10 TAB, 38 REF. EPA PROGRAM 12050 DSH 03/71.

IDEN *SPENT CRANKCASE OIL, *VEGETABLE OIL, *CRUDE OIL, REFINERY WASTE OIL, LOAD TOLERANCE.

KEYWORDS *OIL WASTES, *ACTIVATED SLUDGE, *SEWAGE TREATMENT, *WASTE WATER DISPOSAL, BIOLOGICAL TREATMENT, OIL, BIODEGRADATION, ABSORPTION, SLUDGE TREATMENT

ABSTRACT THE PREFORMANCE OF SMALL SCALE CONTINUOUS ACTIVATED SLUDGE SYSTEMS WAS OBSERVED AFTER BEING EXPOSED TO A VAREITY OF OILY COMPOUNDS SUCH AS CRANKCASE OIL, CRUDE OIL AND VEGETABLE OIL, AT SEVERAL LOADING LEVELS. BATCH STUDIES WERE CONDUCTED TO DETERMINE BIODEGRADABILITY AND THE EFFECT OF EMULSIFICATION AND TEMPERATURE ON THE RATE OF BIOLOGICAL REACTION. OILS ARE ABSORBED ON THE FLOC AND SLOWLY DEGRADE WHEN THEY ARE INTRODUCED INTO AN ACTIVATED SLUDGE SYSTEM. THE OIL ACCUMULATES ON THE SLUDGE CAUSING A LOSS OF DENSITY AND ACCEPTABLE SETTLING CHARACTERISTICS IF THE LOADING RATE IS HIGHER THAN THE DEGRADATION WASTAGE. THE ABILITY OF THE MICROBIAL SYSTEM TO REMOVE OTHER SUBSTRATES IS NOT INHIBITED ALTHOUGH THE BIOLOGICAL SYSTEM FAILS DUE TO THE LOSS OF SLUDGE. 0.10 POUNDS PER DAY PER POUND OF SLUDGE UNDER AERATION SHOULD BE THE MAXIMUM CONTINUOUS FEED LEVEL OF OILS TO ACTIVATED SLUDGE. SHOCK LOADS SHOULD NOT EXCEED 5% OF THE WEIGHT OF THE SLUDGE UNDER AERATION. (SMITH-TEXAS)

TITLE IS INADEQUATE SLUDGE AGE AND DISSOLVED OXYGEN CONTROL PREVENTING OPERATORS FROM GETTING THE BEST FROM THEIR ACTIVATED-SLUDGE PLANTS.

AUTHOR PITMAN, A. R.

PUB DESC WATER POLLUTION CONTROL, VOL 77, NO 1, P 97-99, 1978. 1 FIG.

KEYWORDS *ACTIVATED SLUDGE, *DISSOLVED OXYGEN, *FLOCCULATION, *SUSPENDED SOLIDS, *OPTIMIZATION, OXYGEN DEMAND, BACTERIA, PROTOZOA, WASTE WATER TREATMENT, SLUDGE DIGESTION, MUNICIPAL WASTES.

ABSTRACT THE OPTIMIZATION OF THE ACTIVATED SLUDGE WASTE WATER TREATMENT PROCESS IS CONSIDERED WITH RESPECT TO SLUDGE AGE AND DISSOLVED OXYGEN CONTROL. CLARIFIER CAPACITY INCREASES AT A CONSTANT FEED RATE OF HOMOGENOUS SLUDGE AND A DISSOLVED OXYGEN LEVEL OF 2 MG/LITER. AS SLUDGE AGE INCREASES UNDER THESE CIRCUMSTANCES, EFFLUENT CLARITY IMPROVES DUE TO INCREASED BIOFLOCCULATION EFFICIENCY; THE SLUDGE SETTLING RATE INCREASES WITH HIGHER FLOC DENSITY; AND THE QUANTITY OF SLUDGE PRODUCED DECREASES. THE OXIDATION OF ORGANIC NITROGEN AND AMMONIA ALSO IMPROVES WHILE THE FLOC OXYGEN DEMAND AND MIXED LIQUOR SUSPENDED SOLIDS INCREASE. AS SLUDGE AGE INCREASES, OPTIMUM CONDITIONS ARE APPROACHED. THESE INCLUDE THE REDUCTION OF THE PROTOZOA POPULATION, THE PRESENCE OF BACTERIA IN THE ENDOGENOUS GROWTH PHASE, THE DETERIORATION OF BIOFLOCCULATION, AND THE CONTINUING INCREASE OF FLOC DENSITY, SUSPENDED SOLIDS, TOTAL OXYGEN DEMAND, AND CLARIFIER SOLIDS LEVELS. WHEN SLUDGE AGE EXCEEDS THE OPTIMUM CONDITIONS, DEFLOCCULATION OCCURS. TWO EXAMPLES OF EFFLUENT DEFLOCCULATION ARE PRESENTED. IN ONE CASE, CONTROL OF THE DISSOLVED OXYGEN LEVEL BELOW CAPACITY IMPROVES THE CLARIFIED EFFLUENT QUALITY. IN THE SECOND CASE, REDUCING SLUDGE AGE IMPROVES THE AMBIENT DISSOLVED OXYGEN LEVEL. (LISK-FIRL)

TITLE INTERMEDIATE ACTIVATED SLUDGE. TRAINING MODULE 2.116.3.77.

PUB DATE SEP 77

DESC *INSTRUCTIONAL MATERIALS, *POST SECONDARY EDUCATION, SECONDARY EDUCATION, *TEACHING GUIDES, *UNITS OF STUDY, *WATER POLLUTION CONTROL: *ACTIVATED SLUDGE, OPERATIONS (WASTEWATER), *WASTEWATER TREATMENT

ERIC NO. ED151221

EDRS PRICE EDRS PRICE MF-$0.83 HC-$4.67 PLUS POSTAGE.

DESC NOTE 89P.; FOR RELATED DOCUMENTS SEE SE 024 025-047;

PAGE 81 MISSING FROM DOCUMENT PRIOR TO BEING SHIPPED TO EDRS FOR FILMING; BEST COPY AVAILABLE

ISSUE RIEJUL78

ABSTRACT THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH OPERATION OF ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS AND TRANSPARENCY MASTERS. THIS IS THE SECOND LEVEL OF A THREE MODULE SERIES AND CONSIDERS AERATION DEVICES, PROCESS CONTROL PROCEDURES, MICROORGANISMS AND DATA TREND CHART PLOTTING. (AUTHOR/RH)

TITLE INTRODUCTION TO WASTEWATER TREATMENT PROCESSES.

AUTHOR RAMALHO, R. S.

PUB DATE 77

AVAIL ACADEMIC PRESS, 111 FIFTH AVE., NEW YORK, NY 10003

DESC BIOLOGY, CHEMISTRY, *ENGINEERING, *ENVIRONMENTAL INFLUENCES, EQUIPMENT, FACILITIES, *INSTRUCTIONAL MATERIALS, LAND USE, *POLLUTION, POST SECONDARY EDUCATION, PROBLEM SOLVING, *WASTE DISPOSAL, WATER QUALITY, *WATER POLLUTION CONTROL, *OPERATIONS (WASTEWATER), *WASTEWATER TREATMENT, *FACILITIES

DESC NOTE 409P.

ABSTRACT THIS BOOK INTRODUCES FUNDAMENTAL PROCESSES OF WASTEWATER TREATMENT. THE TEXT IS DESIGNED TO TRAIN THE READER IN EVALUATION OF WASTEWATER TREATMENT PROBLEMS SO THAT PROPER PROCESSES AND EQUIPMENT MAY BE SELECTED. FOR EACH PROCESS THE TEXT PROVIDES: (1) A SUMMARY OF THEORY, INVOLVED IN THAT PROCESS, (2) DEFINITION OF IMPORTANT DESIGN PARAMETERS INVOLVED IN THE PROCESS, AND (3) DEVELOPMENT OF A SYSTEMATIC DESIGN PROCEDURE FOR THE TREATMENT PLANT. EVERY STEP OF THIS SEQUENCE IS ILLUSTRATED WITH NUMERICAL EXAMPLES. (CS)

TITLE LABORATORY CONTROL FOR WASTEWATER FACILITIES, WASTEWATER TECHNOLOGY: A TWO-YEAR POST HIGH SCHOOL INSTRUCTIONAL PROGRAM. VOLUME III, PARTS A, B, C, D, E, F, G.

AUTHOR WAGNER, DAVID; AND OTHERS

PUB DATE JUL 76

DESC BEHAVIORAL OBJECTIVES, CURRICULUM, ENVIRONMENT, *ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, LABORATORY PROCEDURES, *LABORATORY TECHNIQUES, *POLLUTION, POST SECONDARY EDUCATION, *WATER POLLUTION CONTROL, *WASTEWATER TREATMENT

ERIC NO. ED148582

EDRS PRICE EDRS PRICE MF-$0.83 HC-$20.75 PLUS POSTAGE
DESC NOTE 377P.; FOR RELATED DOCUMENTS, SEE SE 023 408-410 AND SE 023 432; CONTAINS OCCASIONAL LIGHT TYPE.
ISSUE RIEMAY78
ABSTRACT THIS VOLUME IS ONE IN A SERIES WHICH OUTLINES PERFORMANCE OBJECTIVES AND INSTRUCTIONAL MODULES FOR A COURSE OF STUDY WHICH EXPLAINS THE RELATIONSHIP AND FUNCTION OF THE PROCESS UNITS IN A WASTEWATER TREATMENT PLANT. EXAMPLES OF MODULES INCLUDE MEASURING SETTLEABLE MATTER, TOTAL SOLIDS, DISSOLVED SOLIDS, SUSPENDED SOLIDS, AND VOLATILE SOLIDS. THE MODULES ARE ARRANGED IN AN ORDER APPROPRIATE FOR TEACHING STUDENTS WITH NO EXPERIENCE. THEY CAN ALSO BE REARRANGED AND ADAPTED FOR COURSES TO UPGRADE PERSONNEL MOVING INTO SUPERVISORY POSITIONS OR DESIGNED AS A MINICOURSE. EACH MODULE CONTAINS A STATEMENT OF PURPOSE, OBJECTIVES, CONDITIONS, ACCEPTABLE PERFORMANCE, INSTRUCTOR ACTIVITY AND STUDENT ACTIVITY. THE TASKS ARE ORGANIZED IN THE GENERAL CATEGORIES: NORMAL OPERATIONS, ABNORMAL OPERATIONS, PREVENTIVE MAINTENANCE, CORRECTIVE MAINTENANCE, LABORATORY CONTROL, SYSTEMS INTERACTION, AND MANAGEMENT/SUPERVISORY PROCEDURES. INCLUDED IN THIS VOLUME ARE 29 MODULES. THE MODULES ARE DESIGNED TO TEACH THE STUDENT LABORATORY PROCEDURES FOR ANALYZING VARIOUS POLLUTANTS AND VARIABLES RELATED TO WASTEWATER. MOST STANDARD TESTS ARE INCLUDED. (CS)
INSTITUTION NAME CHARLES COUNTY COMMUNITY COLL., LA PLATA, MD.; CLEMSON UNIV., S.C.; GREENVILLE TECHNICAL COLL., S.C.; LINN-BENTON COMMUNITY COLL., ALBANY, OREG.

TITLE MANUAL FOR ACTIVATED SLUDGE SEWAGE TREATMENT.
AUTHOR GOODMAN, B. L.
PUB DATE 71
AVAIL TECHNOMIC PUBLISHING CO., INC., 265 WEST STATE STREET, WESTPORT, CT 06880
DESC *ACTIVATED SLUDGE, ENVIRONMENTAL TECHNICIANS, INSERVICE EDUCATION, *INSTRUCTIONAL MATERIALS, *MANUALS, *POST SECONDARY EDUCATION, *SLUDGE, *WASTE DISPOSAL, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL
DESC NOTE 204P.
ABSTRACT STEP BY STEP EXPLANATION OF THE PROCESS, FROM BASICS TO FINE POINTS OF ADVANCED WASTEWATER TREATMENT METHODS.

TITLE MANUAL OF INSTRUCTION FOR SEWAGE TREATMENT PLANT OPERATORS.

PUB DATE 65

AVAIL HEALTH EDUCATION SERVICE, PO BOX 7283, ALBANY, NY 12224 ($2.00)

DESC ANALYTICAL TECHNIQUES, *INSTRUCTIONAL MATERIALS, MAINTENANCE, *MANUALS, *OPERATIONS, *POST SECONDARY EDUCATION, PRIMARY TREATMENT, RECORD KEEPING, *SEWAGE, SLUDGE, *WASTE DISPOSAL, WASTEWATER CHARACTERISTICS, WASTEWATER SLUDGE, *WASTEWATER TREATMENT

DESC NOTE 243P.

ABSTRACT PREPARED FOR GRADE 2 OPERATORS, WRITTEN PRIMARILY AS A TEXT TO BE USED IN CONJUNCTION WITH TRAINING COURSE. HEAVILY NARRATIVE, AVOIDS OVERLY TECHNICAL TREATMENT, AND PRESENTS MATERIAL CONCISELY, APPENDICES SUPPORT BACKGROUND MATERIAL (EG ARITHMETIC, CHEMISTRY, BACTERIOLOGY, ETC). GLOSSARY.

TITLE MANUAL OF INSTRUCTION FOR WASTE TREATMENT PLANT OPERATORS.

AVAIL HEALTH EDUCATION SERVICE, PO BOX 7126, ALBANY, NY 12224 ($2.00)

DESC *CHEMICAL ANALYSIS, *ENVIRONMENT, *INSTRUCTIONAL MATERIALS, NATURAL RESOURCES, *OPERATIONS (WATER), POST SECONDARY EDUCATION, WASTEWATER TREATMENT, *WATER ANALYSIS, WATER POLLUTION CONTROL, *WATER QUALITY

DESC NOTE 308P.

ABSTRACT THIS MANUAL IS INTENDED TO BE A TEXTBOOK FOR A WATER TREATMENT OPERATORS COURSE. IT CONTAINS CHAPTERS ON THE PURPOSE OF WATER TREATMENT, WATER SOURCES AND USES, HYDRAULICS AND ELECTRICITY, WATER CHEMISTRY, MICROBIOLOGY, WATER QUALITY, CHEMICAL COAGULATION, SEDIMENTATION, FILTRATION, CHLORINATION, SOFTENING, AERATION, IRON AND MAGNESIUM, TASTE AND ODOR CONTROL, CORROSION, FLUORIDATION, PROTECTION OF TREATED WATER, RECORDS AND REPORTING, TREATMENT PLANT MAINTENANCE AND ACCIDENT PREVENTION, MATHEMATICS, AND LABORATORY EXAMINATION OF WATER. THE MANUAL SHOULD BE UNDERSTANDABLE TO THE AVERAGE PLANT OPERATOR WITH A HIGH SCHOOL EQUIVALENT BACKGROUND. EXTREMELY TECHNICAL MATERIAL HAS BEEN AVOIDED. (BB)

TITLE A MANUAL OF SIMPLIFIED LABORATORY METHODS FOR OPERATORS OF WASTEWATER TREATMENT FACILITIES.

AUTHOR WESTERHOLD, ARNOLD F., ED.; BENNETT, ERNEST C., ED

PUB DATE APR 74

DESC CHEMISTRY, ENVIRONMENTAL EDUCATION, *ENVIRONMENTAL TECHNICIANS, INDEPENDENT STUDY, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *LABORATORY TECHNIQUES, *POLLUTION, *POST SECONDARY EDUCATION, PUBLIC HEALTH, *WATER POLLUTION CONTROL, *WASTEWATER TREATMENT

ERIC NO. ED149972

EDRS PRICE EDRS PRICE MF-$0.83 HC-$4.67 PLUS POSTAGE. 94P., PAGES 1-1 THROUGH 1-12 (GENERAL INTRODUCTION) REMOVED DUE TO COPYRIGHT RESTRICTION; SECTION 8 MISSING; CONTAINS OCCASIONAL LIGHT TYPE; BEST COPY AVAILABLE

ISSUE RIEJUN78

ABSTRACT THIS MANUAL IS DESIGNED TO PROVIDE THE SMALL WASTEWATER TREATMENT PLANT OPERATOR, AS WELL AS THE NEW OR INEXPERIENCED OPERATOR, WITH SIMPLIFIED METHODS FOR LABORATORYY ANALYSIS OF WATER AND WASTEWATER. IT IS EMPHASIZED THAT THIS MANUAL IS NOT A REPLACEMENT FOR STANDARD METHODS BUT A GUIDE FOR PLANTS WITH INSUFFICIENT EQUIPMENT TO PERFORM ANALYSES IN ACCORDANCE WITH STANDARD METHODS. EACH OF THE SECTIONS IS DESIGNED TO BE COMPLETE WITHIN ITSELF. THE TESTS AND MEASUREMENTS PRESENTED INCLUDE: ACIDS, BIOCHEMICAL OXYGEN DEMAND (BOD), DISSOLVED OXYGEN, RESIDUES, SLUDGE, AND SUSPENDED SOLIDS. (CS)

INSTITUTION NAME ILLINOIS STATE ENVIRONMENTAL PROTECTION AGENCY, SPRINGFIELD.

TITLE THE MATHEMATICS OF ACTIVATED SLUDGE CONTROL.

AUTHOR UHTE, WARREN R.

CORP AUTH BROWN AND CALDWELL, SAN FRANCISCO, CALIF.

AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 42, NO 7, P 1292-1304, JULY 1970. 1 FIG, 1 TAB.

IDEN SUSPENDED SOLIDS, WASTING, COMPUTATION, PROCESS CONTROL.

KEYWORDS *MATHEMATICAL MODEL, *ACTIVATED SLUDGE, *CONTROL, SLUDGE, KINETICS, DESIGN.

ABSTRACT FOR THE USE OF THE MEAN CELL RESIDENCE OR THE SOLIDS RETENTION TIME IN THE CONTROL OF AN ACTIVATED SLUDGE SYSTEM, ONE MUST SELECT THE DESIRED TIME, COMPUTE THE TOTAL SOLIDS PRESENT IN THE SYSTEM AND DETERMINE THE TOTAL VOLATILE SOLIDS TO BE WASTED PER DAY. THE SOLIDS IN THE SYSTEM MAY BE EXPRESSED AS THE SUM OF THOSE IN THE AERATION FACILITIES SECONDARY SEDIMENTATION UNITS AND THE SLUDGE RETURN SYSTEM. SOLIDS ARE WASTED BOTH OVER

THE EFFLUENT WEIR AND THROUGH THE SOLIDS DISPOSAL SYSTEM. NUMERICAL EXAMPLES SHOW THESE COMPUTATIONS FOR CONVENTIONAL, STEP FEED, HIGH RATE AND MULTIPLE STEP OPERATIONS OF AN HYPOTHETICAL PLANT. ASSUMED PLANT DESIGN IS FOR AN 18 MGD FLOW. THE PLANT LAYOUT INCLUDES FOUR AERATION TANKS, MIXED LIQUOR CHANNEL AND RETURN ACTIVATED SLUDGE CHANNEL, AND FOUR SECONDARY SEDIMENTATION BASINS. (HANCUFF-TEXAS)

TITLE MAXIMIZING PHOSPHORUS REMOVAL IN ACTIVATED SLUDGE.

AUTHOR ELLIOTT, W. R.; RIDING, J. T.; SHERRARD, J. H.

CORP AUTH VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF CIVIL ENGINEERING.

PUB DESC WATER AND SEWAGE WORKS, VOL 125, NO 3, P 88-92, MARCH, 1978. 38 REF.

KEYWORDS *PHOSPHORUS, *BIOLOGICAL TREATMENT, *ACTIVATED SLUDGE, *CHEMICAL PERCIPITATION, NUTRIENT REMOVAL, ABSORPTION, BIODEGRADATION, CALCIUM CARBONATE, LIME, PILOT PLANTS, LABORATORY TESTS, HARDNESS (WATER), PHOSPHATES, LIMITING FACTORS, PUBLICATIONS, WASTE WATER TREATMENT, MUNICIPAL WASTES.

ABSTRACT IMPROVING PHOSPHORUS REMOVAL IN ACTIVATED SLUDGE BY MICROBIAL GROWTH, EXCESS UPTAKE, AND CHEMICAL PRECIPITATION WAS DISCUSSED IN A REVIEW OF PUBLISHED EXPERIMENTAL DATA AND ON-SITE TESTS IN WASTE WATER TREATMENT PLANTS. LABORATORY DATA ON MICROBIAL UPTAKE IDENTIFIED THE C:P RATIO AS A LIMITING FACTOR IN PHOSPHORUS REMOVAL; THE HIGHER COD:P RATIO PROVIDED MORE OF THE STOICHIOMETRIC REQUIREMENT. VARIATIONS IN MEAN CELL RESIDENCE TIME AFFECTED PHOSPHORUS REMOVAL, ALTHOUGH THE AVERAGE SLUDGE PHOSPHORUS CONTENT OF 2-3% BY WEIGHT WAS NOT SIGNIFICANTLY IMPROVED. ENHANCED PHOSPHORUS REMOVAL WAS ACHIEVED IN PLUG FLOW REACTORS WITH DISSOLVED OXYGEN CONTROL AT PH6; ANAEROBIC CONDITIONS WERE AVOIDED BY ADEQUATE SLUDGE REMOVAL. BATCH STUDIES ON EXCESS UPTAKE DEMONSTRATED THAT 80% REMOVAL OCCURRED FOR A LOW PHOSPHATE CONCENTRATION, 5MG/LITER, IN THE PRESENCE OF A HIGH MICROBIAL POPULATION. THE PRESENCE OF NA(+) AND K AND THE RATE OF AERATION WERE CITED AS LIMITING FACTORS IN EXCESS PHOSPHORUS UPTAKE. FULL-SCALE STUDIES VERIFIED THAT PHOSPHORUS WAS RELEASED INTO THE EFFLUENT STREAM UNDER ANAEROBIC CONDITIONS. PRECIPITATION WITH CACO3 RESULTED IN HYDROLYSIS OF PHOSPHATES AT THE HEAD OF THE AERATION TANK, DECREASED CO2

GENERATION, AND THE FORMATION OF CALCIUM PHOSPHATE SLUDGE. THE OPTIMUM CONDITIONS FOR PHOSPHORUS REMOVAL IN A PLUG FLOW SYSTEM WERE CONCLUDED TO BE: PH 7.5-8.5 LESS THAN 350 MG/LITER CACO3, AND 24 MG/LITER MG(++). (LISK- FIRL)

TITLE THE METAZOA OF WASTE TREATMENT PROCESSES-ROTIFERS.
AUTHOR CALAWAY, W. T.
CORP AUTH FLORIDA UNIV., GAINESVILLE.
AVAIL JOURNAL OF WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 11, PART 2, P R412-R422, NOV. 1968. 3 FIG, 0 TAB, 23 REF.
IDEN *METAZOA
DESC *ACTIVATED SLUDGE, *ROTIFERS, *MICROBIOLOGY, *EFFICIENCIES, TREATMENT, WASTE TREATMENT, TRICKLING FILTER, SEWAGE TREATMENT, ANIMALS, WASTE WATER TREATMENT.
ABSTRACT DIFFERENT WASTE WATER TREATMENT PROCESSES DEVELOP DIFFERENT CHARACTERISTICS FAUNA. THE ACTIVATED SLUDGE PROCESS COMMONLY SUPPORTS ROTIFERS AS ITS PRINCIPAL METAZOA, TRICKLING FILTERS SUPPORT POPULATIONS OF ROTIFERS, ROUND WORMS, AND ANNELIDS, AND THE METAZOA OF LAGOONS VERY WIDELY. ALTHOUGH THE METAZOA SOMETIMES CAUSE TREATMENT PROBLEMS THEY CONSUME LARGE AMOUNTS OF BACTERIA AND SOLIDS AND THEREFORE ARE GENERALLY HELPFUL IN TREATMENT. THEY ALSO BREAK UP BIOLOGICAL MASSES AND EXPOSE NEW AREAS TO OXYGEN. THE ROTIFERS AID IN KEEPING AN ACTIVELY GROWING BACTERIAL POPULATION BY CONSUMING BACTERIA AND THEREBY ENCOURAGING REPLACEMENT GROWTH. BY CONSUMING UNFLOCCULATED BACTERIA, THE ROTIFERS CONTRIBUTE TO CLEARER EFFLUENCE. THEIR SECRETION CAN ALSO CONTRIBUTE TO FLOCCULATION OF SUSPENDED MATERIALS. THE BDELLOID ROTIFERS DOMINATE AS PROCESS STABILITY IS APPROACHED. (DIFILIPPO-TEXAS)

TITLE MICROSCOPIC ANALYSIS OF PLANKTON, PERIPHYTON, AND ACTIVATED SLUDGE. TRAINING MANUAL.
PUB DATE JUN 76
DESC BIOLOGICAL SCIENCES; CHEMISTRY; ENVIRONMENT; *INSTRUCTIONAL MATERIALS; LABORATORY PROCEDURES, *MANUALS, *MICROBIOLOGY, POST SECONDARY EDUCATION, SCIENCE EDUCATION, *WASTE DISPOSAL, WATER POLLUTION CONTROL, *WATER RESOURCES, *ACTIVATED SLUDGE, *WASTEWATER TREATMENT

ERIC NO. ED161715
DESC NOTE 342P.; CONTAINS OCCASIONAL LIGHT AND SMALL TYPE
ISSUE RIEMAR79
ABSTRACT THIS MANUAL IS INTENDED FOR PROFESSIONAL PERSONNEL IN THE FIELDS OF WATER POLLUTION CONTROL, LIMNOLOGY, WATER SUPPLY AND WASTE TREATMENT, PRIMARY EMPHASIS IS GIVEN TO PRACTICE IN THE IDENTIFICATION AND ENUMERATION OF MICROSCOPIC ORGANISMS WHICH MAY BE ENCOUNTERED IN WATER AND ACTIVATED SLUDGE. METHODS FOR THE CHEMICAL AND INSTRUMENTAL EVALUATION OF PLANKTON ARE COMPARED WITH THE RESULTS OF MICROSCOPIC EXAMINATION IN AN EXTENSIVE PRACTICAL EXERCISE. PROBLEMS OF SIGNIFICANCE AND CONTROL ARE ALSO CONSIDERED. (AUTHOR/BB)

TITLE OPERATION OF WASTEWATER TREATMENT PLANTS: A HOME STUDY TRAINING PROGRAM.
AUTHOR KERRI, K., ED.
PUB DATE 70
AVAIL DEPARTMENT OF CIVIL ENGINEERING, CALIFORNIA STATE UNIVERSITY AT SACRAMENTO, 6000 JAY STREET, SACRAMENTO, CA 95819
DESC ACTIVATED SLUDGE, CHLORINATION, *INSTRUCTIONAL MATERIALS, MAINTENANCE, *MANUALS, *OPERATIONS (WASTEWATER), PRIMARY TREATMENT, *POST SECONDARY EDUCATION, PUMPS, SAFETY, SEDIMENTATION, SLUDGE TREATMENT, STABILIZATION LAGOONS, TRICKLING FILTERS, *WASTE DISPOSAL, *WASTEWATER TREATMENT
DESC NOTE 1317P. REVISED ANNUALLY; ALSO AVAILABLE ON ERIC MICROFICHE ED150008.
ABSTRACT WRITTEN BY EXPERIENCED OPERATORS WITH THE INTENT OF PROVIDING OPERATORS WITH THE INFORMATION THEY NEED TO KNOW TO OPERATE THEIR PLANTS AS EFFICIENTLY AS POSSIBLE. OPERATORS, PERSONS INTERESTED IN BECOMING OPERATORS, AND PERSONS INTERESTED IN THE OPERATION OF TREATMENT PLANTS WILL FIND VALUABLE INFO IN THE MANUAL. TOPICS COVERED INCLUDE DESCRIPTION OF PLANTS, RACKS, SCREENS, COMMINUTORS, GRIT REMOVAL, SEDIMENTATION, TRICKLING FILTERS, ACTIVATED SLUDGE, SLUDGE DISGESTION AND HANDLING, PONDS, CHLORINATION, MAINTENANCE, SAFETY, MATH, LAB, RECORD.

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS: APPENDIX.
AUTHOR WEST, ALFRED W.
PUB DATE MAR 74

DESC *ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, *JOB SKILLS, LABORATORY TRAINING, MANAGEMENT, *MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, ACTIVATED SLUDGE, *WASTEWATER TREATMENT, WATER QUALITY

ERIC NO. ED156472

EDRS PRICE EDRS PRICE MF-$0.83 HC-$2.06 PLUS POSTAGE.

DESC NOTE 37P., FOR RELATED DOCUMENTS, SEE SE 024 421-423; GRAPHS AND CHARTS MAY NOT REPRODUCE WELL

ISSUE RIENOV78

ABSTRACT THIS DOCUMENT IS THE APPENDIX FOR A SERIES OF DOCUMENTS DEVELOPED BY THE NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER DESCRIBING OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS USED IN WASTEWATER TREATMENT. CATEGORIES DISCUSSED INCLUDE: CONTROL TEST DATA, TREND CHARTS, MOVING AVERAGES, SEMI-LOGARITHMIC PLOTS, PROBABILITY PLOT EXAMPLES, TESTING EQUIPMENT AND SYMBOLS AND TERMINOLOGY. (CS)

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS, PART I - OBSERVATIONS, PART II - CONTROL TESTS.

AUTHOR WEST, ALFRED W.

PUB DATE MAY 74

DESC *ENVIRONMENT, *INSTRUCTIONAL MATERIALS, *JOB SKILLS, LABORATORY TRAINING, MANAGEMENT, MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, ACTIVATED SLUDGE, *WASTEWATER TREATMENT, WATER QUALITY

ERIC NO. ED156469

EDRS PRICE EDRS PRICE MF-$0.83 HC-$2.06 PLUS POSTAGE.

DESC NOTE 31P.; FOR RELATED DOCUMENTS, SEE SE 024 422-424; CONTAINS OCCASIONAL LIGHT TYPE; PHOTOGRAPHS MAY NOT REPRODUCE WELL.

ISSUE RIENOV78

ABSTRACT THIS IS THE FIRST IN A SERIES OF DOCUMENTS DEVELOPED BY THE NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER DESCRIBING OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS USED IN WASTEWATER TREATMENT. PART I OF THIS DOCUMENT DEALS WITH PHYSICAL OBSERVATIONS WHICH SHOULD BE PERFORMED DURING EACH ROUTINE CONTROL TEST. PART II DISCUSSES THE CONTROL TESTS THAT ARE USED TO DIRECTLY IDENTIFY PROCESS PERFORMANCE AND TO DICTATE PROCESS CONTROL ADJUSTMENTS. INCLUDED ARE

CENTRIFUGE TESTS, EFFLUENT TURBIDITY TESTS AND DISSOLVED OXYGEN TESTS. (CS)

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS, PART III-A: CALCULATION PROCEDURES.
AUTHOR WEST, ALFRED W.
PUB DATE DEC 73
DESC *CALCULATION, ENVIRONMENT, *INSTRUCTIONAL MATERIALS, *JOB SKILLS, LABORATORY TRAINING, MANAGEMENT, MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, *WASTEWATER TREATMENT, WATER QUALITY
ERIC NO. ED156470
EDRS PRICE EDRS PRICE MF-$0.83 HC-$3.50 PLUS POSTAGE.
DESC NOTE 56P.; FOR RELATED DOCUMENTS, SEE SE 024 421-424
ISSUE RIENOV78
ABSTRACT THIS IS THE SECOND IN A SERIES OF DOCUMENTS DEVELOPED BY THE NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER DESCRIBING OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS USED IN WASTEWATER TREATMENT. THIS DOCUMENT DEALS EXCLUSIVELY WITH THE CALCULATION PROCEDURES, INCLUDING SIMPLIFIED MIXING FORMULAS, AERATION TANK CHARACTERISTICS, ORGANIC LOADING AND PURIFICATION PRESSURES, CLARIFIER SLUDGE FLOW DEMAND, AND MIXING FORMULA DEVELOPMENT. (CS)

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS, PART III-B: CALCULATION PROCEDURES FOR STEP-FEED PROCESS RESPONSES AND ADDENDUM NO. 1.
AUTHOR WEST, ALFRED W.
PUB DATE FEB 75
DESC *CALCULATION, ENVIRONMENT, *INSTRUCTIONAL MATERIALS, *JOB SKILLS, LABORATORY TECHNIQUES, MANAGEMENT, MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, *WASTEWATER TREATMENT, WATER QUALITY
ERIC NO. ED156471
EDRS PRICE EDRS PRICE MF-$0.83 HC-$2.06 PLUS POSTAGE.
DESC NOTE 44P., FOR RELATED DOCUMENTS, SEE SE 024 421-424
ISSUE RIENOV78
ABSTRACT THIS IS THE THIRD IN A SERIES OF DOCUMENTS DEVELOPED BY THE NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER DESCRIBING OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS USED

IN WASTEWATER TREATMENT. THIS DOCUMENT DEALS WITH THE CALCULATION PROCEDURES ASSOCIATED WITH A STEP FEED PROCESS. ILLUSTRATIONS AND EXAMPLES ARE INCLUDED TO EMPHASIZE HOW THE ACTIVATED SLUDGE PROCESS REACTS TO CHANGES IN WASTEWATER FEED-POINT LOCATIONS. THE SUMMARY ILLUSTRATES THE TYPES OF CHANGES THAT OCCUR WHEN A PLUG-FLOW SYSTEM IS SWITCHED TO VARIOUS STEP-FEED COMBINATIONS. (CS)

TITLE OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS - PART I (XT-40).
AUTHOR WEST, A. W.
PUB DATE 71
DESC *AUDIOVISUAL AIDS, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, POLLUTION, *POST SECONDARY EDUCATION, WATER POLLUTION CONTROL, *SLUDGE, *SOLID WASTES, WASTEWATER TREATMENT, *ACTIVATED SLUDGE
DESC NOTE INCLUDED IS A 16 MINUTE TAPE, 51 SLIDES, ALSO A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W ST. CLAIR, CINCINNATI, OHIO 45268
ABSTRACT THIS MODULE IS DESIGNED FOR WASTEWATER WORKS OPERATORS WHO WISH TO UPGRADE PLANT PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. THIS IS PART ONE OF A THREE-PART LESSON SERIES ON OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS. ENTITLED "OBSERVATIONS," THIS FIRST PART IS CONCERNED WITH THE ACCURATE READING OF METERS AND WITH THE VISUAL OBSERVATIONS TO BE MADE BOTH AT THE AERATOR (FOAM CHARACTERISTICS, SLUDGE, COLOR, AND ODOR) AND AT THE FINAL CLARIFIERS (CLARITY, EVIDENCES OF BULKING AND OF SEPTIC SOLIDS). PROVISIONAL INTERPRETATIONS TO BE MADE OF THESE VISUAL OBSERVATIONS ARE PRESENTED, AND THE EFFECTIVE USE OF A SLUDGE BLANKET FINDER IS DISCUSSED IN DETAIL. (AUTHOR/JK)

TITLE OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS - PART II (XT-41).
AUTHOR WEST, A. W.
PUB DATE 71
DESC *AUDIOVISUAL AIDS, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, POLLUTION, *POST SECONDARY EDUCATION, *SOLID WASTES, WATER POLLUTION CONTROL, *SLUDGE, WASTEWATER TREATMENT, *ACTIVATED SLUDGE
DESC NOTE INCLUDED IS A 17 MINUTE TAPE, 47 SLIDES AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W ST. CLAIR, CICINNATI, OHIO 45268

PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. THIS IS PART TWO OF A THREE-PART LESSON SERIES ON OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS. THIS PART IS A DETAILED DISCUSSION OF THE PREFERRED TECHNIQUES INVOLVED IN CONDUCTING SETTLOMETER TESTS TO DETERMINE SETTLING CHARACTERISTICS AND IN CENTRIFUGING SAMPLES TO DETERMINE THE CONCENTRATION OF MIXED LIQUOR AND RETURN SLUDGE. HANDLING THE RELATED SAMPLES IS INCLUDED ALONG WITH PROVISIONAL INTERPRETATIONS AND APPLICATIONS OF THE TESTS. (AUTHOR/JK)

TITLE OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS - PART III (XT-42).
AUTHOR WEST, A. W.
PUB DATE 71
DESC *AUDIOVISUAL AIDS, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, POLLUTION, *POST SECONDARY EDUCATION, *SOLID WASTES, WATER POLLUTION CONTROL, *SLUDGE, WASTEWATER TREATMENT, *ACTIVATED SLUDGE
DESC NOTE INCLUDED IS A 22 MINUTE TAPE, 67 SLIDES, AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W. ST. CLAIR, CINCINNATI, OHIO 45268
ABSTRACT THIS MODULE IS DESIGNED FOR EXPERIENCED WASTEWATER WORKS OPERATORS WHO WISH TO UPGRADE PLANT PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. THIS IS PART THREE OF A THREE-PART LESSON SERIES ON OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS. THIS CONCLUDING PART PRESENTS DEVELOPMENT OF SETTLING AND CONCENTRATION CURVES FROM SETTLOMETER AND CENTRIFUGE TESTS RESULTS, TECHNIQUES FOR CONDUCTING TURBIDITY TESTS AS WELL AS THE SIGNIFICANCE OF TURBIDITY RESULTS, A SUMMARY OF ALL THE TESTS PRESENTED IN THE THREE-PART SERIES, THE CONTROL ADJUSTMENTS WHICH ARE MADE ON THE BASIS OF THESE TEST RESULTS, AND PROGRESSIVE TREND CHARTS OF PROCESS CHARACTERISTICS. (AUTHOR/JK)

TITLE OXYGEN ACTIVATED SLUDGE CONSIDERATIONS FOR INDUSTRIAL APPLICATIONS.
AUTHOR ADAMS, C. E., JR.; ECKENFELDER, W. W., JR.; KOON, J. H.; SHELBY, S. E.
CORP AUTH AWARE, INC., NASHVILLE, TN.
PUB DESC AVAILABLE FROM COPYRIGHT CENTER, INC., NEW YORK, NY AS 0065-8812-78-9754-0178 ($0.95). IN: WATER--1977, AICHE SYMPOSIUM SERIES, VOL 74, NO 178, EDITED BY G. F. BENNETT, P 93-101, 1978, 9 FIG, 6 REF.

156

KEYWORDS *ACTIVATED SLUDGE, *WASTE WATER TREATMENT, *INDUSTRIAL WASTE, *OXYGENATION, *BIOLOGICAL TREATMENT, *EVALUATION, WASTE TREATMENT, AERATION, HYDROGEN ION CONCENTRATION, ORGANIC COMPOUNDS, SLUDGE, SUSPENDED SOLIDS, ECONOMICS, COSTS, APPRAISALS, INSTALLATION COSTS, OPERATING COSTS, ODOR.

ABSTRACT A NUMBER OF FACTORS ARE DISCUSSED WHICH MUST BE EVALUATED WHEN ASSESSING THE RELATIVE MERITS OF AIR OXYGENTED VERSUS PURE OXYGEN OXYGENATED ACTIVATED SLUDGE SYSTEMS FOR INDUSTRIAL USE. ORGANIC REMOVAL KINETICS MAY PLAY A MORE IMPORTANT ROLE IN TREATING INDUSTRIAL WASTES THAN MUNICIPAL WASTES BECAUSE OF THEIR HIGH STRENGTH. IT IS SHOWN THAT A HIGHER DISSOLVED OXYGEN LEVEL IN THE AERATION BASIN WILL RESULT IN A HIGHER RESISTANCE TO ORGANIC SHOCK LOADINGS AND A MORE AEROBIC FLOC. A HIGHER TEMPERATURE BECAUSE OF THE ENCLOSURE OF THE AERATION BASIN IS AN ADVANTAGE OF THE PURE OXYGEN SYSTEM, ESPECIALLY IN COLD CLIMATES. EQUILIBIRUM OF THE AERATION BASIN PH CAN BE A PROBLEM WITH THE PURE OXYGEN SYSTEM BECAUSE IT INTAILS A SLIGHTLY LOWER PH. WITH HIGHLY ACIDIC INDUSTRIAL WASTE WATERS IT MAY BE DIFFICULT TO MAINTAIN PH TO AN ACCEPTABLE RANGE BETWEEN 6.5 AND 7.5. ALSO, THE ENCLOSED OXYGEN SYSTEM MAY RESULT IN DIFFICULTIES BY RETAINING VOLATILE ORGANICS WHICH CAN INHIBIT THE SYSTEM. PURE OXYGEN SYSTEMS ARE PREFERABLE TO AIR OXYGEN SYSTEMS FOR CONTROL OF ODORS AND SUSCEPTIBILITY TO SHOCK LOADINGS. ANOTHER FACTOR TO BE CONSIDERED IS MIXED LIQUOR VOLATILE SUSPENDED SOLIDS CONCENTRATIONS WHICH CAN BE HANDLED EFFECTIVELY BY BOTH SYSTEMS IF THEY ARE PROPERLY DESIGNED; HOWEVER, THE PURE OXYGEN SYSTEM DOES HAVE THE ADVANTAGE OF BEING ABLE TO SUPPLY SUFFICIENT OXYGEN TO MAINTAIN RELATIVELY HIGH MIXED LIQUOR OR SOLIDS LEVELS WITHOUT REQUIRING USE OF HIGH POWER LEVELS WHICH WOULD PROMOTE BREAK-UP OF FLOC PARTICLES. ECONOMICALLY, A PURE OXYGEN SYSTEM COSTS MORE TO CONSTRUCT BUT MAY OFFER SUBSTANTIAL SAVINGS IN OPERATING COSTS, BASED MOSTLY ON THE POWER REQUIREMENTS TO ACHIEVE THE NECESSARY DISSOLVED OXYGEN CONCENTRATION. (SEE ALSO W79-00342) (MAJTENYI-IPA)

TITLE PERFORMANCE OF CIRCULAR FINAL CLARIFIERS AT AN ACTIVATED SLUDGE PLANT

AUTHOR MUNCH, W. L.; FITZPATRICK, J. A.
CORP AUTH METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

PUB DESC JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 50, NO 2, P 265-276, FEBRUARY, 1978. 10 FIG, 2 TAB, 10 REF.

KEYWORDS *ACTIVATED SLUDGE, *SETTLING BASINS, *HYDRAULIC MODELS, *SOLID WASTES, *SEPARATION TECHNIQUES, SUSPENDED SOLIDS, HYDRAULICS, EFFLUENT STREAMS, PERFORMANCE, WASTE WATER TREATMENT, MUNICIPAL WASTES.

ABSTRACT THE PERFORMANCE OF A 38 M-DIAM CIRCULAR CENTER-FEED CLARIFIER WAS EVALUATED UNDER VARYING CONDITIONS OF HYDRAULIC AND SOLIDS LOADING AT AN ACTIVATED SLUDGE TREATMENT FACILITY IN CHICAGO, ILLINOIS. LIMITING THE EFFLUENT FLOW TO 0.66 CU M/SEC WITH A 30% RETURN RATE ALLOWED A MAXIMUM SOLIDS LOADING RATE FOR EFFICIENT CLARIFICATION OF 146 KG/SQ M/DAY AT A MIXED LIQUOR CONCENTRATION OF 2,500 MG/LITER. HIGHER FLOW RATES WERE POSSIBLE WHEN THE MIXED LIQUOR CONTENT WAS DECREASED. A HIGHER SOLIDS LOADING RATE WAS ACCOMMODATED BY THE CLARIFIER WHEN THE HYDRAULIC LOADING RATE WAS MAINTAINED BELOW 0.83 CU M/SEC, VERIFYING THE DEPENDENCE OF SOLIDS LOADING ON HYDRAULIC LOAD. AN INCREASE IN THE THICKNESS OF THE SLUDGE BLANKET, OCCURRING AT HYDRAULIC LOADING IN EXCESS OF 0.83 CU M/SEC AT A 30% RETURN, THREATENED THE SOLIDS SEPARATION EFFICIENCY OF THE CLARIFIER. SLUDGE BLANKET LEVEL, SOLIDS SETTLEABILITY, AND HYDRAULIC LOADING REPORTEDLY HAD A GREATER IMPACT ON CLARIFIER SOLIDS SEPARATION PERFORMANCE THAN SHOCK HYDRAULIC LOADING. THE ACTUAL MAXIMUM SOLIDS LOADING RATE WAS SIGNIFICANTLY LOWER THAN THE THEORETICAL MAXIMUM. (LISK-FIRL)

TITLE PRIMARY TREATMENT AND SLUDGE DIGESTION WORKSHOP.

PUB DATE SEP 77

AVAIL PUBLICATIONS CENTRE, ONTARIO MINISTRY OF GOVERNMENT SERVICES, 880 BAY ST., 5TH FLOOR, TORONTO, ONTARIO, CANADA M7A 1N8 ($2.00; ORDERS MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER PAYABLE TO "THE TREASURER OF ONTARIO")

DESC *BEHAVIORAL OBJECTIVES; *ENVIRONMENTAL EDUCATION; ENVIRONMENTAL TECHNICIANS, EQUIPMENT, JOB SKILLS, *POLLUTION, SAMPLING, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *WORKSHOPS, ONTARIO, *SLUDGE, *WASTEWATER TREATMENT

ERIC NO. ED155002

EDRS PRICE EDRS PRICE MF-$0.83 PLUS POSTAGE. HC NOT AVAILABLE FROM EDRS.

158

DESC NOTE 269P; FOR RELATED DOCUMENTS, SEE SE 024 226-233, NOT AVAILABLE IN HARD COPY DUE TO COPYRIGHT RESTRICTIONS; CONTAINS COLORED PAGES WHICH MAY NOT NOT REPRODUCE WELL

ISSUE RIEOCT78

ABSTRACT THIS MANUAL WAS DEVELOPED FOR USE AT WORKSHOPS DESIGNED TO UPGRADE THE KNOWLEDGE OF EXPERIENCED WASTEWATER TREATMENT PLANT OPERATORS. EACH OF THE SIXTEEN LESSONS HAS CLEARLY STATED BEHAVIORAL OBJECTIVES TO TELL THE TRAINEE WHAT HE SHOULD KNOW OR DO AFTER COMPLETING THAT TOPIC. AREAS COVERED IN THIS MANUAL INCLUDE: SEWAGE CHARACTERISTICS; COLLECTION, TREATMENT, AND SEDIMENTATION; AEROBIC AND ANAEROBIC DIGESTION; SAMPLING AND INTERPRETATION; MONITORING AND CONTROL; AND SELECTED TESTS. (CS)

TITLE PROCESS CONTROL BY OXYGEN-UPTAKE AND SOLIDS ANALYSIS.

AUTHOR BENEFIELD, L. D.; RANDALL, C. W.; KING, P. H.

CORP AUTH MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF CIVIL ENGINEERING.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 47, NO 10, P 2498-2503, OCTOBER, 1975. 2 FIG, 6 REF.

IDEN PROCESS CONTROL, *OXYGEN-UPTAKE, *SOLIDS ANALYSIS, CLARIFIERS, SLUDGE AGE, SLUDGE WASTING, SUBSTRATE CONCENTRATION.

KEYWORDS OXYGEN, *SOLIDS CONTACT PROCESSES, WASTE WATER TREATMENT, *ACTIVATED SLUDGE, ANALYSIS, SLUDGE TREATMENT, MICROORGANISM, MATHEMATICS, CONTROL SYSTEMS.

ABSTRACT THE MOST COMMON METHODS USED BY PLANT OPERATORS TO CONTROL THE ACTIVATED SLUDGE PROCESS ARE DISCUSSED. THE THEORETICAL BASIS FOR ANOTHER METHOD HAVING CERTAIN ADVANTAGES OVER THE OTHERS WAS STUDIED. FOUR CONTROL METHODS IN COMMON USE ARE: SLUDGE WASTING TO MAINTAIN A CONSTANT MASS OF ORGANISMS IN THE SYSTEM; SLUDGE WASTING TO MAINTAIN A CONSTANT SPECIFIC RATE OF SUBSTRATE UTILIZATION; SLUDGE WASTING TO MAINTAIN A CONSTANT SLUDGE AGE; AND HYDRAULIC CONTROL TO MAINTAIN A CONSTANT SLUDGE AGE. THE LAST TWO, IN WHICH THE SLUDGE AGE IS KEPT CONSTANT, ARE THE MOST FAVORABLE ONES. THE MAJOR WEAKNESS IN THESE METHODS IS THE CONTINUAL SHIFTING IN THE SOLIDS BALANCE BETWEEN THE AERATION TANK AND THE CLARIFIER AS THE INFLUENT FLOW RATE DEVIATES. A NEW METHOD IS PROPOSED IN WHICH THE SOLIDS

SEPARATE AT A RATE SUCH THAT THE SOLIDS CONCENTRATION IS MAINTAINED IN THE SLUDGE RETURN LINES AND NO MICROBIAL GROWTH OCCURS IN THE SECONDARY CLARIFIER. ADVANTAGES OF THIS METHOD INCLUDE: THE EFFECT OF THE FLUCTUATING SOLIDS LEVEL IN THE SECONDARY CLARIFIER IS MINIMIZED; ANY CHANGE IN THE INFLUENT SUBSTRATE CONCENTRATION WILL BE REFLECTED IMMEDIATELY IN THE OXYGEN UPTAKE RATE; AND LOADING FLUCTUATIONS CAN BE COMPENSATED FOR BY VARYING THE INTERVAL BETWEEN CONTROL PERIODS. DISADVANTAGES OF THIS METHOD INCLUDE: THE REQUIREMENT FOR A LABORATORY STUDY TO DETERMINE CHANGES IN THE CONSTANTS; MORE OPERATOR ATTENTION THAN IS REQUIRED IN THE HYDRAULIC METHOD FOR CONTROLLING SLUDGE AGE; AND MATHEMATICAL MANIPULATIONS ARE REQUIRED THAN IN ANY OTHER OF THE METHODS. (PINTO-FIRL)

TITLE PROCESS CONTROL DEMANDS - PART A (XT-60)
WEST, A.
PUB DATE NOV 72
DESC *AUDIOVISUAL AIDS; *INSTRUCTIONAL MATERIALS; POLLUTION; *POST SECONDARY EDUCATION; SLIDES; WASTES; *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, *OPERATIONS (WASTEWATER)
DESC NOTE INCLUDED IS A 10 MINUTE TAPE, 19 SLIDES, AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W. ST. CLAIR, CINCINNATI, OHIO 45268
ABSTRACT THIS MODULE IS DESIGNED FOR EXPERIENCED WASTEWATER WORKS OPERATORS WHO DESIRE TO UPGRADE PLANT PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. PROVIDED IS AN INTRODUCTION TO A SERIES ON OPERATIONAL CONTROL OF AN ACTIVATED SLUDGE PROCESS. A PLANT SCHEMATIC IS USED TO PRESENT THE EFFECTS OF RETURN SLUDGE FLOW ADJUSTMENTS ON SLUDGE CONCENTRATIONS, SLUDGE DETENTION TIMES, PROCESS EQUILIBRIUM, SLUDGE CHARACTERISTICS, AND FINAL EFFLUENT QUALITY. (AUTHOR/JK)

TITLE PROCESS CONTROL DEMANDS - PART B (XT-61).
WEST, A.
PUB DATE NOV 72
DESC *AUDIOVISUAL AIDS, *INSTRUCTIONAL MATERIALS, POLLUTION, *POST SECONDARY EDUCATION, *TECHNICAL EDUCATION, *WATER POLLUTION CONTROL, *PLANT OPERATIONS, *WASTEWATER TREATMENT, SLUDGE, *ACTIVATED SLUDGE

DESC NOTE INCLUDED IS A 15 MINUTE TAPE AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W. ST. CLAIR, CINCINNATI, OHIO 45268

ABSTRACT THIS MODULE IS DESIGNED FOR EXPERIENCED WASTEWATER WORKS OPERATORS WHO WISH TO UPGRADE PLANT PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. ONE OF A SERIES, THIS MODULE PRESENTS THE DERIVATION OF MIXING FORMULA THAT WILL BE USED IN SUBSEQUENT SECTIONS TO DEVELOP THE RETURN SLUDGE FLOW DEMAND FORMULA USED IN OPERATIONAL CONTROL OF AN ACTIVATED SLUDGE PROCESS. A SCHEMATIC IS USED TO ILLUSTRATE COMPONENTS OF THE FORMULA AND TO DEVELOP A FINAL MASS BALANCE RATIO OF RETURN SLUDGE CONCENTRATION TO MIXED LIQUOR CONCENTRATION IN TERMS OF CLARIFIER SLUDGE PERCENTAGE. SIMPLE MIXING FORMULAE ARE THEN DERIVED FOR EACH OF THE THREE FACTORS ALONG WITH EXAMPLE CALCULATIONS. (AUTHOR/JK)

TITLE PROCESS DESIGN MANUAL: WASTEWATER TREATMENT FACILITIES FOR SEWERED SMALL COMMUNITIES.

AUTHOR LEFFEL, R. E.; AND OTHERS

PUB DATE OCT 77

DESC *ENGINEERING, ENVIRONMENT, *INSTRUCTIONAL MATERIALS, *MANUALS, POLLUTION, *POST SECONDARY EDUCATION, SCIENCE EDUCATION, TECHNICAL REPORTS, *UTILITIES, *WASTE DISPOSAL, WATER POLLUTION CONTROL, WATER RESOURCES, *WASTEWATER TREATMENT, *OPERATIONS (WASTEWATER), RURAL AREAS

ERIC NO. ED162869

EDRS PRICE EDRS PRICE MF-$1.00 HC-$26.11 PLUS POSTAGE.

DESC NOTE 496P.; FOR RELATED DOCUMENTS, SEE SE 025 368-370

ISSUE RIEAPR79

ABSTRACT THIS MANUAL ATTEMPTS TO DESCRIBE NEW TREATMENT METHODS, AND DISCUSS THE APPLICATION OF NEW TECHNIQUES FOR MORE EFFECTIVELY REMOVING A BROAD SPECTRUM OF CONTAMINANTS FROM WASTEWATER. TOPICS COVERED INCLUDE: FUNDAMENTAL DESIGN CONSIDERATIONS, FLOW EQUALIZATION, HEADWORKS COMPONENTS, CLARIFICATION OF RAW WASTEWATER, ACTIVATED SLUDGE, PACKAGE PLANTS, FIXED GROWTH SYSTEMS, WASTEWATER TREATMENT PONDS, FILTRATION AND MICROSCREENING, PHYSICAL-CHEMICAL TREATMENT, NUTRIENT REMOVAL, SLUDGE AND PROCESS SIDESTREAM HANDLING, DISINFECTION AND POSTAERATION, OPERATION AND MAINTENANCE, AND COST EFFECTIVENESS. A GLOSSARY IS ALSO INCLUDED. (AUTHOR/BB)

INSTITUTION NAME CAMP, DRESSLER & MCKEE, INC., BOSTON, MASS.

TITLE ROLE OF ACTIVATED SLUDGE FINAL SETTLING TANKS.

AUTHOR DICK, RICHARD I.

CORP AUTH ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.

AVAIL JOURNAL OF THE SANITARY ENGINEERING DIVISION, ASCE, VOL 96, NO SA2, P 423-436, APRIL 1970. 10 FIG, 17 REF.

IDEN *THICKENING, *FINAL SETTLING TANK, *FLUX RATE, CLARIFICATION, SUSPENDED SOLIDS.

KEYWORDS *ACTIVATED SLUDGE, SEWAGE TREATMENT, SEDIMENTATION, *WASTE WATER TREATMENT.

ABSTRACT THE FINAL SETTLING TANK IN THE ACTIVATED SLUDGE PROCESS HAS TWO FUNCTIONS: CLARIFICATION AND THICKENING. CONVENTIONAL DESIGN PROCEDURES HAVE CONSIDERED ONLY THE CLARIFICATION FUNCTION. HOWEVER, INADEQUATE PERFORMANCE OF THICKENING FUNCTIONS PRODUCES ADVERSE EFFECTS, INCLUDING: LOSS OF SUSPENDED SOLIDS TO THE EFFLUENT AND INSUFFICIENT SUSPENDED SOLIDS CONCENTRATION IN THE SLUDGE RECYCLE WHICH LEADS TO LOWER MIXED LIQUOR SUSPENDED SOLIDS CONCENTRATIONS IN THE AERATION TANK. TO ASSURE PROPER PERFORMANCE OF THE FINAL SETTLING TANK THE TANK SHOULD BE SIZED FOR EACH FUNCTION AND THE LARGER SIZE SHOULD GOVERN THE DESIGN. THE AREA REQUIRED FOR THICKENING MUST BE SUFFICIENT SO THAT SOLIDS ARE APPLIED TO THE TANK AT A RATE LESS THAN THE RATE AT WHICH SOLIDS ARE ABLE TO REACH THE BOTTOM OF THE TANK. THE RATE WHICH BIOLOGICAL SOLIDS REACH THE BOTTOM OF THE TANK IS TERMED THE FLUX RATE. CHARACTERISTICALLY, THIS FLUX RATE PASSES THROUGH A MINIMUM FOR SOME CONCENTRATION OF ACTIVATED SLUDGE PRESENT IN THE SETTLING TANK. THIS MINIMUM FLUX RATE ACTS AS A BOTTLENECK AND GOVERNS THE AREA REQUIRED FOR THICKENING. SEVERAL METHODS FOR DETERMINING THE LIMITING CAPACITY ARE GIVEN IN AN ILLUSTRATIVE EXAMPLE. (DIFILIPPO-TEXAS)

TITLE SEWAGE TREATMENT: BASIC PRINCIPLES AND TRENDS.

AUTHOR BOLTON, R. L.; KLEIN, L.

76

AVAIL ANN ARBOR SCIENCE PUBLISHERS, P.O. BOX 1425, ANN ARBOR, MI 48106

DESC CALCULATION, *CHEMICAL ANALYSIS, CHEMISTRY, ENVIRONMENTAL INFLUENCES, *INSTRUCTIONAL MATERIALS, MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, *PUBLIC HEALTH, *WASTE DISPOSAL, WATER QUALITY, *WATER POLLUTION CONTROL, *OPERATIONS (WASTEWATER), *WASTEWATER TREATMENT

ABSTRACT PROVIDED IS INFORMATION ON THE BASIC PRINCIPLES OF THE PROCESSES OF SEWAGE TREATMENT, ESPECIALLY AS IT RELATES TO THE CHEMISTRY OF SEWAGE TREATMENT. THE TEXT DISCUSSES THE NATURE OF SEWAGE AND CHEMICAL ANALYSIS AND THEN PROCEEDS THROUGH THE TREATMENT PROCESSES TO FINAL DISPOSAL. THE LAST CHAPTERS DEAL WITH CURRENT TRENDS IN THE FIELD OF WATER POLLUTION CONTROL AND WITH CHEMICAL CALCULATIONS. CONVERSION TABLES FOR BRITISH METRIC UNITS ARE INCLUDED IN THE APPENDIX.

TITLE SEWAGE TREATMENT PLANT DEPENDABILITY WITH SPECIAL REFERENCE TO THE ACTIVATED SLUDGE PROCESS.

AUTHOR WEST, A. W.

CORP AUTH NATIONAL FIELD INVESTIGATIONS CENTER - CINCINNATI, OHIO.

AVAIL AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161, AS PB-231 070, $3.25 IN PAPER COPY. $2.25 IN MICROFICHE, MARCH, 1971. 12 P.

KEYWORDS *SEWAGE TREATMENT, *DESIGN CRITERIA, *OPERATION AND MAINTENANCE, FACILITIES, *ACTIVATED SLUDGE, BIOLOGICAL TREATMENT, WATER POLLUTION CONTROL, WATER QUALITY CONTROL, *TREATMENT FACILITIES, *WASTE WATER TREATMENT.

ABSTRACT THIS WORK IS A REFERENCE FOR SEWAGE TREATMENT PLANT DEPENDABILITY LECTURES PRESENTED AT TRAINING SESSIONS, SYMPOSIA, AND WORKSHOPS. DESIGN CONSIDERATIONS NECESSARY TO ACHIEVE CONSISTENTLY SATISFACTORY PLANT PERFORMANCE AND FINAL EFFLUENT QUALITY INCLUDE THE PROPER TREATMENT PROCESSES, A GENEROUS PLANT CAPACITY, ESSENTIAL FLEXIBILITY, AND TRUE CONTROLLABILITY OF THE PLANT. THE TREATMENT PROCESS OR MODIFICATION MOST APPROPRIATE TO THE KNOWN WASTE CHARACTERISTICS AND EFFLUENT QUALITY REQUIREMENTS SHOULD BE CHOSEN. EXAMPLES INCLUDE THE CLASSIC ACTIVATED SLUDGE PROCESS, THE COMPLETE MIX MODIFICATION AND THE STEP AERATION MODIFICATION. PILOT STUDIES ON A BENCH, PILOT, OR DEMONSTRATION SCALE MAY BE PERFORMED TO RESOLVE UNCERTAINITIES ABOUT THE CORRECT PROCESS TO CHOOSE. THE SUGGESTIONS CONTAINED IN DESIGN CRITERIA MANUALS SUCH AS THE "10-STATES STANDARDS" SHOULD BE CONSIDERED AS MINIMUM REQUIREMENTS NEEDED TO PROVIDE ADEQUATE SAFETY FACTORS TO ASSURE PLANT DEPENDABILITY. ITEMS DISCUSSED UNDER FLEXIBILITY OF A PLANT INCLUDE: PROCESS; AERATION TANKS; FINAL CLARIFIERS; RETURN SLUDGE PUMPING FACILITIES; EXCESS SLUDGE WASTING; EMERGENCY

CHEMICAL TREATMENT; SLUDGE HANDLING FACILITIES; EQUALIZING TANKS; AND HOLDING PONDS. THE ACTIVATED SLUDGE SYSTEM IS A CONTROLLABLE PROCESS THAT SHOULD HAVE THE APPROPRIATE METERS AND ACCURATELY CONTROLLABLE GATES, VALVES, PUMPS, AND BLOWERS FOR OPTIMUM PERFORMANCE. QUALIFIED OPERATORS ARE NEEDED TO ACHIEVE THE HIGH QUALITY EFFLUENT THAT CAN BE PRODUCED BY A PROPERLY DESIGNED WASTE TREATMENT PLANT; DEDICATED, EXPERIENCED OPERATORS ARE NEEDED EVEN MORE AT PLANTS WHICH HAVE DESIGN DEFECTS. (ORR-FIRL)

TITLE START-UP MUNICIPAL WASTEWATER TREATMENT FACILITIES.

AUTHOR RADAR, R. D.; GREEN, R. L.; PAGE, G. L., JR.

CORP AUTH WILEY AND WILSON, INC., LYNCHBURG, VA

AVAIL FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402 PRICE $1.40. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC, OFFICE OF WATER PROGRAM OPERATION, REPORT EPA-43019-74-008, DECEMBER 1973. 92P, 3 FIG, 2 TAB, 42 REF. EPA CONTRACT 68-01-0341.

IDEN PROCEDURES, PROCESS, SEED SLUDGE, STAFFING, STANDARD OPERATING PROCEDURES, SITE MEETINGS, INVENTORY INSPECTION PRETESTING, OPERATOR TRAINING, SETTLEABLE SOLIDS, TOTAL SOLIDS, VOLATILE SOLIDS, VOLATILE ACIDS, MIXED LIQUOR SUSPENDED SOLIDS.

KEYWORDS *ADMINISTRATIVE DECISIONS, *TREATMENT FACILITIES, *WASTE WATER TREATMENT, *OPERATIONS, *LABORATORY TESTS, *SAMPLING, TESTING, ANALYSIS, CONTROLS, ACTIVATED SLUDGE, TRICKLING FILTER, OXIDATION LAGOONS, ANAEROBIC DIGESTION, SAFETY, CHLORINATION, SUSPENDED SOLIDS, HYDROGEN ION CONCENTRATION, ALKALINITY, BIOCHEMICAL OXYGEN DEMAND, CHEMICAL OXYGEN DEMAND, PRE-TREATMENT (WATER), SEWAGE TREATMENT.

ABSTRACT THIS MANUAL PROVIDES GUIDANCE FOR PUTTING INTO INITIAL OPERATION MUNICIPAL WASTEWATER TREATMENT PLANT, A NEW ADDITION TO AN EXISTING TREATMENT PLANT, OR A CHANGE IN THE MODE OF THE TREATMENT PLANT'S OPERATION SO THAT THE TREATMENT PLANT OR PROCESS WILL EFFECTIVELY TREAT THE WASTEWATER IN COMPLIANCE WITH SPECIFIC CONDITIONS AND LIMITATIONS ESTABLISHED FOR TREATMENT FACILITY. THE MANUAL WAS DEVELOPED AND PREPARED WITH THE AID AND COOPERATION OF WASTEWATER TREATMENT PLANT OPERATORS AND SUPERINTENDENTS, START-UP EXPERTS, THE ACADEMIC COMMUNITY, MANUFACTURERS AND

SUPPLIERS OF WASTEWATER TREATMENT PLANT EQUIPMENT, AND A LITERATURE REVIEW OF WASTEWATER TREATMENT PLANT OPERATIONS AND RECOGNIZED START-UP TECHNIQUES. INFORMATION IS PROVIDED ON PREPARING FOR ACTUAL TREATMENT PLANT START-UP. PREPARATIONS FOR START-UP INCLUDE: STAFFING THE PLANT, DEVELOPING STANDARD OPERATING PROCEDURES, DRY- AND WET-RUN TESTING OF EQUIPMENT, ON-SITE OPERATOR TRAINING, SAFETY, AND ESTABLISHING PROCEDURES WHEN CONSTRUCTION IS CONTINUING DURING START-UP. THIS MANUAL DESCRIBES START-UP PROCEDURES FOR SOME OF THE MORE COMMON PRETREATMENT AND PRIMARY TREATMENT UNITS; FOR THE SPECIFIC SECONDARY TREATMENT PROCESSES OF ACTIVATED SLUDGE, TRICKLING FILTERS, STABILIZATION PONDS AND AERATED LAGOONS; AND FOR THE SLUDGE HANDLING UNITS AND THE ANAEROBIC DIGESTION PROCESS. THE START-UP PROCEDURES FOR ADVANCED WASTEWATER TREATMENT UNITS AND PROCESSES ARE NOT CONSIDERED IN THIS MANUAL. (EPA)

TITLE UPGRADING BIOLOGICAL TREATMENT (XT-25).
AUTHOR WEST, A. W.
PUB DATE AUG 71
DESC *AUDIOVISUAL AIDS, ENGINEERING, *INSTRUCTIONAL MATERIALS, POLLUTION, *POST SECONDARY EDUCATION, *WATER POLLUTION CONTROL, *PLANT OPERATIONS, *WASTEWATER TREATMENT, *BIOLOGICAL TREATMENT
DESC NOTE INCLUDED IS A 28 MINUTE TAPE AND 63 SLIDES, ALSO A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W. ST. CLAIR, CINCINNATI, OHIO 45268
ABSTRACT THIS MODULE IS DESIGNED FOR EXPERIENCED AND SUPERVISORY WASTEWATER WORKS OPERATORS AND MANAGERIAL PERSONNEL, AND SHOULD ALSO BE OF INTEREST TO DESIGN ENGINEERING PERSONNEL. IT DISCUSSES WAYS TO GET MAXIMUM USE OF PRESENT EXISTING SECONDARY TREATMENT PROCESSES BY IMPROVED OPERATIONAL CONTROL OF DESIGN. IT INCLUDES CASE HISTORIES OF HOW THE POLLUTIONAL STRENGTH OF AN ACTIVATED SLUDGE PLANT EFFLUENT WAS REDUCED TO ONE-QUARTER OF ITS FORMER STRENGTH AT ONE LOCATION, AND HOW TRICKLING FILTER PRETREATMENT WITH ACTIVATED SLUDGE POLISHING ACCOMPLISHED 99% REDUCTION FOR A COMBINATION OF DOMESTIC SEWAGE AND STRONG MEAT PACKING WASTES AT ANOTHER. (AUTHOR/JK)

TITLE USE OF HIGH-PURITY OXYGEN IN THE ACTIVATED SLUDGE PROCESS, VOLUME 1.
AUTHOR MCWHIRTER, J. R.

PUB DATE 78
AVAIL CRC PRESS, INC., 2255 PALM BEACH LAKES BLVD., WEST PALM BEACH, FL 33409
DESC ACTIVATED SLUDGE, DEWATERING, *INSTRUCTIONAL MATERIALS, OPERATIONS, *OXYGEN, POST SECONDARY EDUCATION, *SECONDARY TREATMENT, *WASTE DISPOSAL, WASTEWATER SLUDGE, *WASTEWATER TREATMENT
DESC NOTE 250P. CAT. NO. 5101EF32
ABSTRACT CONSTITUTES A COMPREHENSIVE SOURCE OF BACKGROUND AS WELL AS CURRENT-DAY TECHNOLOGY STATUS REGARDING THE USE OF OXYGEN IN SECONDARY WASTEWATER TREATMENT. DIVIDED INTO THREE BASIC PARTS, THE FIRST SECTION CONSISTS OF BACKGROUND AND HISTORICAL INFORMATION, THE SECOND DEALS WITH CURRENT-DAY DESIGN AND APPLICATIONS. THE LAST IS ON PRESENT-DAY EXPERIENCE AND OPERATIONAL INFORMATION FROM OXYGENATION SYSTEMS CURRENTLY IN OPERATION AND UNDER DESIGN.

TITLE USE OF HIGH-PURITY OXYGEN IN THE ACTIVATED SLUDGE PROCESS, VOLUME 2.
AUTHOR MCWHIRTER, J. R.
PUB DATE 78
AVAIL CRC PRESS, INC., 2255 PALM BEACH LAKES BLVD., WEST PALM BEACH, FL 33409
DESC ACTIVATED SLUDGE, DEWATERING, *INSTRUCTIONAL MATERIALS, OPERATIONS, *OXYGEN, POST SECONDARY EDUCATION, *SECONDARY TREATMENT, *WASTE DISPOSAL, WASTEWATER SLUDGE, *WASTEWATER TREATMENT
DESC NOTE 250P. CAT. NO. 5102EF32

TITLE WASTEWATER ENGINEERING: COLLECTION, TREATMENT, DISPOSAL.
PUB DATE 72
DESC MCGRAW-HILL BOOK COMPANY, 1221 AVENUE OF THE AMERICAS, NEW YORK, NY 10020
*DESIGN, *ENGINEERING, *FACILITIES, *INSTRUCTIONAL MATERIALS, *OPERATIONS (WASTEWATER), POST SECONDARY EDUCATION, PUMPS, *SEWERS, SLUDGE, *WASTEWATER TREATMENT, WATER CHARACTERISTICS, *WATER RESOURCES
DESC NOTE 782P. (NO. 041675-3); SOLUTION MANUAL (NO. 041676-1)
ABSTRACT INCLUDES: DEVELOPMENT AND TRENDS IN WASTEWATER ENGINEERING; DETERMINATION OF SEWAGE FLOWRATES; HYDRAULICS OF SEWERS; DESIGN OF SEWERS; PUMPS AND PUMPING STATIONS; WASTEWATER CHARACTERISTICS; PHYSICAL UNIT OPERATIONS; CHEMICAL UNIT PROCESSES; DESIGN OF FACILITIES FOR: PHYSICAL AND CHEMICAL

TREATMENT OF WASTEWATER, FOR BIOLOGICAL TREATMENT, DISPOSAL OF SLUDGE AND MORE.

TITLE WASTEWATER TREATMENT - SERIES C.
AVAIL NEW ENGLAND REGIONAL WASTEWATER INST., 2 FORT ROAD, SOUTH PORTLAND, ME 04106 (FREE RENTAL)
DESC CHEMICAL TREATMENT, DISINFECTION, FILTRATION, *INSTRUCTIONAL MATERIALS, *PRIMARY TREATMENT, POST SECONDARY EDUCATION, SEDIMENTATION, *SECONDARY TREATMENT, *SLIDES, SLUDGE DEWATERING, STABILIZATION LAGOONS, *TERTIARY TREATMENT, VISUAL AIDS, WASTE DISPOSAL, *WASTEWATER TREATMENT
DESC NOTE ORDER SERIES C WITH ACCOMPANYING NARRATIVE: 100 SLIDES.
ABSTRACT FOCUSING ON THE TECHNICAL ASPECTS OF WASTEWATER TREATMENT. IT FEATURES PRIMARY AND SECONDARY FACILITIES AND INCLUDES SEGMENTS ON THE TRAINING OF PLANT OPERATORS AND ON SAFETY.

TITLE WATER AND WASTEWATER TREATMENT: CALCULATIONS FOR CHEMICAL AND PHYSICAL PROCESSES.
AUTHOR HUMENICK, MICHAEL J. JR.
PUB DATE 77
AVAIL MARCEL DEKKER, 270 MADISON AVE., NEW YORK, NY 10016
ABSTRACT THIS BOOK PRESENTS THE INFORMATION NEEDED BY AN ENVIRONMENTAL TECHNICIAN TO PERFORM THE PROCESS CALCULATIONS NECESSARY IN THE OPERATION OF WATER OR WASTEWATER TREATMENT FACILITIES. THE MATERIAL IS ORGANIZED SO AS A PROBLEM IS PRESENTED, THE SOLUTION FOLLOWS IMMEDIATELY. EACH TOPIC AREA HAS NUMEROUS PRACTICE EXAMPLES WITH SOLUTIONS AND ANSWERS. SUBJECT AREAS INCLUDE: COAGULATION AND FLOCCULATION; WATER CONDITIONS, SEDIMENTATION; FILTRATION; ACTIVATED CARBON; ADSORPTION; CHLORINATION AND AERATION. THE APPENDICES CONTAIN INFORMATION REGARDING PHYSICAL AND CHEMICAL PROPERTIES, CONVERSION FACTORS, AND COMPUTER PROGRAMS. (CS)

TITLE WATER AND WASTEWATER TREATMENT, VOL. 4
AUTHOR HUMENICK, MICHAEL J., JR.
PUB DATE 77
DESC *CALCULATION, *CHEMICAL REACTIONS, *DESIGN, ENVIRONMENTAL INFLUENCES, ENGINEERING, *INSTRUCTIONAL MATERIALS, POLLUTION, *POST SECONDARY EDUCATION, PUBLIC HEALTH, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *OPERATIONS (WASTEWATER), *OPERATIONS (WATER), *WASTEWATER

TREATMENT, WATER TREATMENT

DESC NOTE 236P.

ABSTRACT INCLUDED IN THIS VOLUME ARE CALCULATION PROCEDURES WHICH CAN BE UTILIZED IN THE DESIGN OF SUCH PROCESSES AS EQUALIZATION, COAGULATION AND FLOCCULATION, CHEMICAL PRECIPITATION, AND GRAVITY SEDIMENTATION. EXAMPLES OF PROBLEMS RELATED TO FILTRATION, ACTIVATED CARBON ABSORPTION, ION EXCHANGE, CHLORINATION, DISINFECTION, AND AERATION ARE ALSO COVERED. INFORMATION OF PHYSICAL AND CHEMICAL PROPERTIES, CONVERSION FACTORS, AND COMPUTER PROGRAMS ARE DETAILED IN THE APPENDIXES. (CS)

TITLE WPCF WASTEWATER TREATMENT PLANT OPERATOR TRAINING PROGRAM, INTERMEDIATE COURSE: STUDENT WORKBOOK, VOL. 1, PARTS 1 AND 2.

PUB DATE 78

AVAIL WATER POLLUTION CONTROL FEDERATION, 2626 PENNSYLVANIA AVE., WASHINGTON, D.C. 20036

DESC *ACTIVATED SLUDGE, AUDIOVISUAL AIDS, CERTIFICATION, *CLARIFICATION (WASTEWATER), ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *OPERATIONS (WASTEWATER), POLLUTION, *POST SECONDARY EDUCATION, *WASTEWATER COLLECTION, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL.

DESC NOTE 244P. COURSE MATERIALS: 35 MM SLIDES (340), 9 TAPE CASSETTES, ADMINISTRATOR HANDBOOK, CARRYING CASE, AND STUDENT WORKBOOK (PARTS 1 AND 2) - ORDER NO. E0291 $400.00; STUDENT WORKBOOK ONLY - ORDER NO. E0292, $4.50; OTHER VOLUMES; EW003822 AND EW003823

ABSTRACT THIS DOCUMENT IS ONE IN A SERIES OF SELF-INSTRUCTIONAL WORKBOOKS FOR TRAINING WASTEWATER TREATMENT PLANT OPERATIONS IN THE BASIC FUNCTIONS OF FACILITY OPERATION. THE WORKBOOK CONTAINS A PRE- AND POST-TEST QUESTIONNAIRE FOR EACH UNIT AS WELL AS SELF-TESTS AS INTERIM GUIDES. THE UNITS DISCUSSED IN THE VOLUME ARE A GENERAL INTRODUCTION, THE COMMUNITY WASTEWATER SYSTEM, PRE-TREATMENT, CLARIFICATION, AND ACTIVATED

TITLE SLUDGE. (CS)

WPCF WASTEWATER TREATMENT OPERATOR TRAINING PROGRAM, INTERMEDIATE COURSE: STUDENT WORKBOOK, VOL. 8.

PUB DATE 78

AVAIL WATER POLLUTION CONTROL FEDERATION, 26226 PENNSYLVANIA AVE., WASHINGTON, DC 20037

DESC AUDIOVISUAL AIDS, CERTIFICATION, *ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *OPERATIONS (WASTEWATER), POLLUTION, *POST SECONDARY EDUCATION, *SLUDGE, *TRICKLING FILTERS, *WASTE STABILIZATION PONDS, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL.

DESC NOTE 144P. COURSE MATERIALS: 35 MM SLIDES (APPROX. 230), 7 TAPE CASSETTES, ADMINISTRATOR HANDBOOK, CARRYING CASE, AND STUDENT WORKBOOK - ORDER NO. E0293, $300.00; STUDENT WORKBOOK ONLY - ORDER NO. E0294, $3.50; OTHER VOLUMES: EW003821 AND EW003823

ABSTRACT THIS DOCUMENT IS ONE IN A SERIES OF SELF-INSTRUCTIONAL WORKBOOKS FOR TRAINING WASTEWATER TREATMENT PLANT OPERATORS IN THE BASIC FUNCTIONS OF FACILITY OPERATION. THE WORKBOOK CONTAINS A PRE- AND POST-TEST QUESTIONNAIRE FOR EACH UNIT AS WELL AS SELF-TESTS AS INTERIM GUIDES. THE UNITS DISCUSSED IN THIS VOLUME ARE WASTE STABILIZATION PONDS, TRICKLING FILTERS, AND SLUDGE HANDLING AND DIGESTION. (CS)

TITLE WPCF WASTEWATER TREATMENT PLANT OPERATOR TRAINING PROGRAM, INTERMEDIATE COURSE: STUDENT WORKBOOK, VOL. C.

PUB DATE 78

AVAIL WATER POLLUTION CONTROL FEDERATION, 2626 PENNSYLVANIA AVE., WASHINGTON, D.C. 20037

DESC AUDIOVISUAL AIDS, CERTIFICATION, *DISINFECTION, *ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *OPERATIONS (WASTEWATER), POLLUTION, *POST SECONDARY EDUCATION, *PUMPS, *SAFETY, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL.

DESC NOTE 90P. COURSE MATERIALS: 35 MM SLIDES (APPROX. 270), 7 TAPE CASSETTES, ADMINISTRATOR HANDBOOK, CARRYING CASE, AND STUDENT WORKBOOK - ORDER NO. E0296, $3.50; OTHER VOLUMES: EW003821 AND EW003822

ABSTRACT THIS DOCUMENT IS ONE IN A SERIES OF SELF-INSTRUCTIONAL WORKBOOKS FOR TRAINING WASTEWATER TREATMENT PLANT OPERATORS IN THE BASIC FUNCTIONS OF FACILITY OPERATION. THE WORKBOOK CONTAINS A PRE- AND POST-TEST QUESTIONNAIRE FOR EACH UNIT AS WELL AS SELF-TESTS AS INTERIM GUIDES. THE UNITS DISCUSSED IN THIS VOLUME ARE DISINFECTION, SAFETY, AND PUMPING.

Part IV

Reference Materials
Not Abstracted

TITLE THE ABC WAY TO BETTER WASTEWATER TREATMENT.
AUTHOR KERL, J. F.
CORP AUTH ENVIRONMENTAL QUALITY ENGINEERING, INC., OAKLAND, CALIF.
AVAIL AMERICAN DYESTUFF REPORTER, VOL 62, NO 8, P 24-25, AUGUST 1973. 1 FIG, 1 ILLUS, 2 REF.

TITLE ACTINOMYCETES OF SEWAGE-TREATMENT PLANTS.
AUTHOR LECHEVALIER, H. A.; LECHEVALIER, M. P.; WYSZKOWSKI, P. E.
CORP AUTH RUTGERS - THE STATE UNIV., PISCATAWAY, NJ. WAKSMAN INST. OF MICROBIOLOGY.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-272 589, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-77-145, 1977. 89 P. 6 FIG, 15 TAB, 5 REF.

TITLE ACTINOMYCETES OF SEWAGE-TREATMENT PLANTS.
AUTHOR LECHEVALIER, H. A.
CORP AUTH RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. WAKSMAN INST. OF MICRIBIOLOGY.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161, AS PB-245 914, $4.50 IN PAPER COPY, $3.00 IN MICROFICHE. ENVIRONMENTAL PROTECTION AGENCY, ENVIRONMENTAL PROTECTION TECHNOLOGY STUDIES SERIES NO. EPA-600/2-75-031, SEPTEMBER 1975. 62 P, 23 TAB, 19 REF. R-802003.

TITLE ACTIVATED SLUDGE.
AUTHOR SAUNDERS, F. M.
CORP AUTH GEORGIA INST. OF TECH., ATLANTA.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 6, P 1005-1016, JUNE, 1977. 114 REF.

TITLE ACTIVATED SLUDGE (LITERATURE REVIEW).
AUTHOR SCHROEDER, E. D.
CORP AUTH CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 6, P 1098-1107, JUNE, 1976. 110 REF.

TITLE ACTIVATED SLUDGE (LITERATURE REVIEW).
AUTHOR AZAD, H. S.; BERGMANN, D. E.; STUMPF, M. R.
CORP AUTH WATER POLLUTION CONTROL FEDERATION, WASHINGTON, DC
AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 42, NO 6, P 897-910, JUNE 1970. 105 REF.

TITLE ADDITION OF POWDERED ACTIVATED CARBON TO ACTIVATED SLUDGE REACTORS.
AUTHOR KLEI, H. E.; SUNDSTROM, D. W.
CORP AUTH CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-264 887, IN PAPER COPY, IN MICROFICHE. COMPLETION REPORT, MARCH 1977. 41 P, 2 TAB, 27 FIG, 4 REF, OWRT A-057-CONN(1), 14-31-0001-5007.

TITLE ADVANCED AUTOMATIC CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE TREATMENT PROCESS.
AUTHOR PETERSACK, J. F.; SMITH, R. G.
CORP AUTH SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161. ENVIRONMETNAL PROTECTION AGENCY, REPORT EPA-670/2-75-039. MAY 1975., 154 P, 33 FIG, 11 TAB, 14 REF, 3 APPEND. 1BB043; ROAP 21ASC; TASK 007 R800356.

TITLE AERATION TANK FOR ACTIVATED SLUDGE TREATMENT OF WASTE WATER - IS SMALLER AND REQUIRES LESS POWER FOR A GIVEN TREATMENT CAPACITY.
AVAIL NETHERLANDS PATENT NL 7610-431. ISSUED MARCH 28, 1977. DERWENT NETHERLANDS PATENTS ABSTRACTS, VOL Y, NO 15, P D5, MAY, 1977.

TITLE AIR V. OXYGEN IN DORSET.
AVAIL WATER AND WASTE TREATMENT, VOL 20, NO 1, P 14-15, JANUARY, 1977. 1 FIG, 1 TAB.

TITLE AIR VS O2: TWO ACTIVATED SLUDGE SYSTEMS COMPARED.
AUTHOR MILLER, M. A.
CORP AUTH UNION CARBIDE CORP., TONAWANDA, NY ENVIRONMENTAL SYSTEMS DEPT.
AVAIL WATER AND WASTES ENGINEERING, VOL 15, NO 4, P 58-60, 62-65, APRIL, 1978. 6 FIG, 8 TAB, 17 REF.

TITLE ALBUQUERQUE PLANT DESIGNED WITH COMPUTER IN MIND.
AUTHOR RICOY, J. L.; MATOTAN, W. I.
CORP AUTH WILLIAM MATOTAN AND ASSOCIATES, ALBUQUERQUE, NM
AVAIL WATER AND WASTES ENGINEERING, VOL 13, NO 1, P 32-35, 37, JANUARY, 1976.

TITLE ALUM ADDITION AIDS SLUDGE PROCESS IN PHOSPHORUS REMOVAL.
AVAIL WATER AND WASTES ENGINEERING, VOL 15, NO 3, P 14, MARCH, 1978.

TITLE ALUM ADDITION TO ACTIVATED SLUDGE WITH TERITARY SOLIDS REMOVAL.
AUTHOR HAIS, A. B.; STAMBERG, J. B.; BISHOP, D. F.
CORP AUTH DISTRICT OF COUMBIA DEPT. OF ENVIRONMENTAL SERVICES, WASHINGTON.
AVAL COPY AVAILABLE FROM GPO SUP AS EP1.23:670-73-037, $0.65; MICROFICHE FROM NTIS AS PB-225 028/0, $1.45. ENVIRONMENTAL PROTECTION AGENCY, TECHNOLOGY SERIES REPORT EPA-670/2-73-037, AUGUST 1973, 25 P, 7 FIG, 5 TAB, 8 REF. EPA PROJECT 11010 EYM. CONTRACT 14-12-818.

TITLE ALUM ADDITION AND STEP-FEED STUDIES IN OXYGEN ACTIVATED SLUDGE.
AUTHOR BISHOP, D. F.; HEIDMAN, J. A.; BRENNER, R. C.; STAMBERG, J. B.
CORP AUTH DEPARTMENT OF ENVIRONMENTAL SERVICES, WASHINGTON, DC.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-272 892, IN PAPER COPY, IN MICROFICHE, REPORT EPA-600/2-77/166, 1977. 31 P, 6 FIG, 10 TAB, 10 REF.

TITLE APPLICATION OF MICROBIOLOGY AND BIOENGINEERING PRINCIPLES TO BIOLOGICAL WASTE TREATMENT.
AUTHOR LEVIN, GILBERT V.; COHEN, OBADIAH P.
CORP AUTH BIOSPHERICS INC., ROCKVILLE, MD
AVAIL CHEMICAL ENGINEERING PROGRESS, SYMPOSIUM SERIES, VOL 67, NO 107, P 131-134, 1971. 1 TAB, 44 REF.

TITLE ATP POOLS IN ACTIVATED SLUDGE.
AUTHOR CHIU, S. Y.; KAO, I. C.; ERICKSON, L. E.;
CORP AUTH FAN, L. T. KANSAS STATE UNIV., MANHATTAN. DEPT. OF CHEMICAL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 45, NO 8, P 1746-1758, AUGUST 1973. 18 FIG, 4 TAB, 30 REF. OWRR A-045-KAN(3) 14-31-0001-3516.

TITLE AUTOMATIC DISSOLVED OXYGEN CONTROL.
AUTHOR FLANAGAN, M. J.; BRACKEN, B. D.; ROESLER, J. F.
CORP FLANAGAN AND ASSOCIATES, SAN FRANCISCO, CALIF.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, PROCEEDINGS OF ASCE, VOL 103, NO EE4, P 707-722, DIVISION, PROCEEDINGS OF ASCE, VOL 103, NO EE4, P 707-722, AUGUST 1977. 9 TAB, 5 FIG, 3 REF, 1 APPEND.

TITLE AUTOMATION OF THE CONTROL AND OPERATION OF WATER POLLUTION CONTROL WORKS.
AUTHOR COTTON, P.
CORP AUTH NORWICH SEWAGE TREATMENT WORKS (ENGLAND)
AVAIL WATER POLLUTION CONTROL, VOL 72, NO 8, P 635-657, 1973. 25 REF.

173

TITLE BIOFLOCCULATION AND THE ACCUMULATION OF CHEMICALS BY FLOC-FORMING ORGANISMS.
AUTHOR DUGAN, P. R.
CORP AUTH OHIO STATE UNIV., COLUMBUS, DEPT. OF MICROBIOLOGY.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-245 793, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-75-032, SEPTEMBER 1975. 148 P, 51 FIG, 21 TAB, 119 REF.

TITLE BIOLOGICAL CONCEPTS FOR DESIGN AND OPERATION OF THE ACTIVATED SLUDGE PROCESS.
AUTHOR GAUDY, F., JR.; GAUDY, T.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER, BIOENVIRONMENTAL ENGINEERING LABS.
AVAIL GPO SUP DOC AS EP 2.10: 17090 FQJ 09/71, $1.25; MICROFICHE FROM NTIS AS PB-211 131, $0.95. ENVIRONMENTAL PROTECTION AGENCY, WATER POLLUTION CONTROL RESEARCH SERIES, SEPTEMBER 1971. 154 P, 36 FIG, 3 TAB, 69 REF. EPA PROGRAM 17090 FQJ 09/71.

TITLE BIOLOGICAL METHODS FOR CONTROL OF NITROGEN IN MUNICIPAL WASTEWATERS.
AUTHOR ROSENKRANZ, W. A.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. OFFICE OF RESEARCH AND DEVELOPMENT.
AVAIL IN: 3RD USA/USSR SYMPOSIUM ON INTENSIFICATION OF BIO-CHEMICAL TREATMENT OF WASTEWATERS, HELD AT VOGEDO HEADQUARTERS, MOSCOW, USSR ON AUGUST 23-24, 1976. P 32-35, 1976. 4 FIG, 2 TAB, 5 REF.

TITLE BIOLOGICAL REGENERATION OF POWERED ACTIVATED CARBON ADDED TO ACTIVATED SLUDGE UNITS.
AUTHOR DEWALLE, F. B.; CHIAN, E. S. K.
CORP AUTH ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.
AVAIL WATER RESEARCH, VOL 11, NO 5, P 439-446, 1977. 9 FIG, 2 TAB, 33 REF.

TITLE BIOLOGICAL TREATMENT PROCESS IN COLD CLIMATES.
AUTHOR BOYLE, J. D.
CORP AUTH CH2M/HILL, CORVALLIS, OREG. WASTEWATER RECLAMATION.
AVAIL WATER AND SEWAGE WORKS, REFERENCE NUMBER, P R-28, R-30, R-32-R-34, R-37-R-38, R-43-R-44, R-46, R-48, R-50, APRIL 30, 1976. 16 FIG, 2 TAB, 9 REF.

TITLE BIOLOGICAL WASTE TREATMENT.
AUTHOR JANK, B. E.
CORP AUTH DEPARTMENT OF THE ENVIORNMENT, OTTAWA (ONTARIO). WASTEWATER TECHNOLOGY CENTRE.
AVAIL IN: PROCEEDINGS OF SEMINARS ON WATER POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY, MAY 1975, OTTAWA, MONCTON, AND PRINCE GEORGE, CANADA, ENVIRONMENTAL PROTECTION SERVICE,

WATER POLLUTION CONTROL DIRECTORATE, ECONOMIC AND TECHNICAL REVIEW REPORT EPS 3-WP-76-4, P 35-80, MARCH, 1976. 14 FIG, 31 REF, 4 TAB.

TITLE BULKING CONTROL MADE EASY - WITH HYDROGEN PEROXIDE.
AUTHOR STRUNK, W. G.; SHAPIRO, J.
CORP AUTH FMC CORP., PRINCETON, NJ.
AVAIL WATER AND POLLUTION CONTROL, VOL 114, NO 7, P 10, 12, 14, 15, 40-41, JULY, 1976.

TITLE CASE HISTORIES: IMPROVED ACTIVATED SLUDGE PLANT PERFORMANCE BY OPERATIONS CONTROL.
AUTHOR WEST, A. W.
CORP AUTH FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, CINCINNATI, OHIO. DIV. OF TECHNICAL SERVICES.
AVAIL PROCEEDINGS, 8TH ANNUAL ENVIRONMENTAL AND WATER RESOURCES ENGINEERING CONFERENCE, JUNE 5-6, 1969, TECHNICAL REPORT NO 20, DEPARTMENT OF ENVIRONMENTAL AND WATER RESOURCES ENGINEERING, VANDERBILT UNIVERSITY, P 161-170, (1969).

TITLE CELL YIELD AND GROWTH RATE IN ACTIVATED SLUDGE.
AUTHOR SHERRARD, J.H.; SCHROEDER, E. D.
CORP AUTH CORNELL UNIV., ITHACA, NY SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 45, NO 9, P 1889-1897, SEPTEMBER 1973. 8 FIG, 2 TAB, 12 REF.

TITLE CHEMICALLY ASSISTED BIOLOGICAL OXIDATION OF WASTES AND EXCESS SLUDGE.
AUTHOR GAUDY, A. F., JR.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER, BIOENVIRONMENTAL ENGINEERING LABS.
AVAIL WATER AND SEWAGE WORKS, REFERENCE ISSUE, P 48, 50-52, 54-56, APRIL, 1977. 11 FIG, 10 REF.

TITLE COMPARING DESIGN MODELS FOR ACTIVATED SLUDGE.
AUTHOR GAUDY, A. F., JR.; KINCANNON, D. F.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER. BIOENVIRONMENTAL ENGINEERING LABS.
AVAIL WATER AND SEWAGE WORKS, VOL 124, NO 2, P 66-70, FEBRUARY 1977. 1 FIG, 7 TAB, 16 REF.

TITLE COMPARISON OF COMPLETELY MIXED AND PLUG FLOW BIOLOGICAL SYSTEMS.
AUTHOR TOERBER, E. D.; PAULSON W. L.; SMITH, H. S.

CORP AUTH FEHR AND GRAHAM CONSULTING ENGINEERS, FREEPORT, ILL.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 46, NO 8, P 1995-2014, AUGUST 1974. 26 FIG, 9 TAB, 3 REF.

TITLE COMPUTER-ASSISTED ACTIVATED SLUDGE PLANT OPERATION.
AUTHOR LACROIX, P. G.; BLOODGOOD, D. E.
CORP AUTH OTTAWA UNIV. (ONTARIO). DEPT. OF CIVIL ENGINEERING.
AVAIL EFFLUENT AND WATER TREATMENT JOURNAL, VOL 13, NO 11, P 701-714, NOVEMBER 1973. 3 FIG, 2 TAB, 26 REF.

TITLE CONTROL OF ACTIVATED SLUDGE BULKING DURING BIOLOGICAL PURIFICATION (REGULIROVANIE PRIROSTA AKTIVNOGO ILA PRI BIOLOGICHESKOI OCHISTKE).
AUTHOR EVILEVICH, M. A.; KOROVIN, L. K.
CORP AUTH GIPROBUM (USSR).
AVAIL BUMAZHNAYA PROMYSHLENNOST, NO 8, P 27-28, AUGUST, 1978. 3 FIG, 1 TAB.

TITLE CONTROL OF ACTIVATED SLUDGE BY MEAN CELL RESIDENCE TIME.
AUTHOR JENKINS, DAVID; GARRISON, WALTER E.
CORP AUTH CALIFORNIA UNIV., BERKELEY. SANITATION ENGINEERING RESEARCH LAB.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 11, PART 1, P 1905-1919, NOV 1968. 6 FIG, 2 TAB, 15 REF.

TITLE DEMONSTRATION OF A HIGH-RATE ACTIVATED SLUDGE SYSTEM.
AUTHOR HUANG, C. H.; FEURSTEIN, D. L.; MILLER, E. L.
CORP AUTH ENGINEERING-SCIENCE, INC., BERKELEY, CALIF.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-240 005, IN PAPER COPY, IN MICROFICHE, REPORT EPA-670/2-75-037, MARCH 1975. 150 P, 25 FIG, 22 TAB, 46 REF, 1 APPEND.

TITLE DESIGN AND CONTROL OF NITRIFYING ACTIVATED SLUDGE. SYSTEMS.
AUTHOR LAWRENCE, A. W.; BROWN, C. G.
CORP AUTH CORNELL UNIV., ITHACA, NY DEPT. OF ENVIRONMENTAL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 7, P 1779-1803, JULY 1976. 13 FIG, 8 TAB,

TITLE THE DESIGN AND OPERATION OF ACTIVATED SLUDGE FINAL SETTLING TANKS.
AUTHOR HIBBERD, R. L.; JONES, W. F.
CORP AUTH SATEC LTD., CREWE (ENGLAND).
AVAIL WATER POLLUTION CONTROL, VOL 78, NO 1, P 14-32, 1974, 13 FIG, 9 TAB, 11 REF.

TITLE THE DESIGN AND SELECTION OF MECHANICAL AERATION DEVICES.
AUTHOR SHAW, J. A.
CORP AUTH LIGHTNIN MIXER PTY LTD., CAMBERWELL (AUSTRALIA).
AVAIL IN: WATER POLLUTION CONTROL IN DEVELOPING COUNTRIES. PROCEEDINGS OF THE INTERNATIONAL CONFERENCE, HELD AT BANGKOK, THAILAND, FEBRUARY 1978. EDITED BY E.A.R. OUANO, B. M. LOHANI & C.M. THANH. ASIAN INSTITUTE OF TECHNOLOGY, BANGKOK, THAILAND, (PERGAMON PRESS IN USA), P 709-722, 1978. 13 FIG.

TITLE DESIGNING AND OPERATING AN OXYGEN ACTIVATED SLUDGE SYSTEM INCLUDING TERTIARY ALUM-MUD PRECIPITATION.
AUTHOR FULLER, R. R.; GILBERT, D. W.
CORP AUTH GULF STATES PAPER CORP., TUSCALOOSA, AL.
AVAIL COPYRIGHT CLEARANCE CENTER, INC., NEW YORK, NY AS 0065-8812-78-9661-0178 ($1.25). IN: WATER--1977, AICHE SYMPOSIM SERIES, VOL 74, NO 178, EDITED BY G. F. /BENNETT, P 48-65, 1978, 6 FIG, 6 TAB, 3 REF.

TITLE DESIGN AND OPERATIONAL MODEL FOR COMPLETE MIXING ACTIVATED SLUDGE SYSTEM.
AUTHOR MCKINNEY, R. E.
CORP AUTH KANSAS UNIV., LAWRENCE.
AVAIL BIOTECHNOLOGY AND BIOENGINEERING, VOL 16, NO 6, P 703-722, JUNE, 1974. 14 REF.

TITLE EFFECT OF PRIMARY EFFLUENT SUSPENDED SOLIDS AND BOD ON ACTIVATED SLUDGE PRODUCTION.
AUTHOR VOSHEL, DORIS; SAK, J. G.
CORP AUTH GRAND RAPIDS WATER POLLUTION CONTROL PLANT, MICH., AND DOW CHEMICAL CO., MIDLAND, MICH.
AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 5, PART 2, P R203-R212, MAY 1968. 8 FIG, 3 TAB, 10 REF.

TITLE EFFECT OF WASTEWATER COMPOSITION AND CELL RESIDENT TIME ON PHOSPHORUS REMOVAL IN ACTIVATED SLUDGE.
AUTHOR STALL, T. R.; SHERRARD, J. H.
CORP AUTH PHILLIPS PETROLEUM CO., BARTLESVILLE, OKLA.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 2, P 307-322, FEBRUARY, 1976, 8 FIG, 4 TAB, 23 REF.

TITLE EFFECTS OF DISSOLVED OXYGEN IN THE OXYGENATION ACTIVATED SLUDGE PROCESS.
AUTHOR D'ANTONI, J. M.; STEIMLE, S. E.
CORP AUTH NUS CORP., HOUSTON, TX.
AVAIL COPYRIGHT CLEARANCE CENTER, INC., NEW YORK, NY AS 0065-8812-78-9823-1078 ($0.95). IN: WATER-1977, AICHE SYMPOSIUM SERIES, VOL 74, NO 178, EDITED BY G. F. BENNETT, P 66-74, 1978, 9 FIG, 2 TAB, 10 REF.

TITLE EFFECTS OF FLOW EQUALIZATION ON THE OPERATION AND PERFORMANCE OF AN ACTIVATED SLUDGE PLANT.
AUTHOR FOESS, G. W.; MEENAHAN, J. G.; BLOUGH, D.
CORP AUTH YPSILANTI TOWNSHIP, MI.
AVAIL THE NATIONAL TECHNICAL INFORMAITON SERVICE, SPRINGFIELD, VA 22161 AS PB-272 657, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-77-138, 1977. 95 P, 8 FIG, 17 TAB, 20 REF, 1 APPEND.

TITLE THE EFFECT OF HIGH PURITY OXYGEN ON THE ACTIVATED SLUDGE PROCESS.
AUTHOR BENEFIELD, L. D.; RANDALL, C. W.; KING, P. H.
CORP AUTH MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 2, P 269-279, FEBRUARY, 1977. 17 FIG, 1 TAB, 12 REF.

TITLE EFFECTS OF IRON ON ACTIVATED SLUDGE TREATMENT.
AUTHOR CARTER, J. L.; MCKINNEY, R. E.
CORP AUTH MARQUETTE UNIV., MILWAUKEE, WIS.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL 99, NO EE2, P 135-152, APRIL 1973. 9 FIG, 3 TAB, 24 REF.

TITLE THE EFFECT OF SLUDGE WITHDRAWALS ON THE OPERATION OF SMALL ACTIVATED SLUDGE PLANTS.
AUTHOR DRAUTZ, K. E.
CORP AUTH RENSSELAER POLYTECHNIC INST., TROY, NY
AVAIL MASTERS'S THESIS, JUNE 1969. 111 P, 15 FIG, 34 TAB, 17 REF.

TITLE EVALUATION OF A COMPLETE MIXING ACTIVATED SLUDGE PLANT.
AUTHOR MCKINNEY, ROSS E.; BENJES, HENRY H., JR.; WRIGHT, JAMES R.
CORP AUTH KANSAS UNIV., LAWRENCE.
AVAIL JOURNAL OF WATER POLLUTION CONTROL FEDERATION, VOL 42, NO 5, PART 1, P 737-752, MAY 1970. 10 FIG, 1 TAB, 19 REF.

TITLE EVALUATION OF THE KRAUS MODEL OF ACTIVATED SLUDGE BULKING.
AUTHOR PIPES, WESLEY O.; MEADE, FRANK S.
CORP AUTH NORTHWESTERN UNIV., EVANSTON, ILL.
AVAIL PROCEEDINGS INDUSTRIAL WASTE CONFERENCE, 23RD, MAY 1968, P 111-125, 5 FIG, 7 TAB, 8 REF.

TITLE AN EXPERIMENTAL STUDY OF THE ROLE OF THE CILIATED PROTOZOA IN THE ACTIVATED SLUDGE PROCESS.
AUTHOR CURDS, C. R.; COCKBURN, A.; VANDYKE, JENNIFER M.
CORP AUTH WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
AVAIL WATER POLLUTION CONTROL, VOL 67, NO 3, 1968. P 312-329, 14 FIG, 3 TAB, 13 REF.

TITLE FACTORS AFFECTING EFFLUENT QUALITY FROM FILL-AND-DRAW ACTIVATED SLUDGE REACTORS.
AUTHOR DAIGGER, G. T.; GRADY, C. P. L., JR.
CORP AUTH PURDUE UNIV., LAFAYETTE, IN. ENVIRONMENTAL ENGINEERING LAB.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 12, P 2390-2396, DECEMBER, 1977. 1 FIG, 4 TAB, 12 REF.

TITLE FACTORS TO BE CONSIDERED IN THE DESIGN OF ACTIVATED SLUDGE PLANTS.
AUTHOR DOWNING, A. L.
CORP AUTH WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
AVAIL ADVANCES IN WATER QUALITY IMPROVEMENTS, (EDITORS: GLOYNA, E. F., AND ECKENFELDER, W. W., JR.), AUSTIN, TEXAS, UNIVERSITY OF TEXAS PRESS, 1968, P 190-202, 8 FIG, 14 REF.

TITLE FATE OF PHOSPHORUS IN WASTE TREATMENT PROCESSES: ENHANCED REMOVAL OF PHOSPHATE BY ACTIVATED SLUDGE.
AUTHOR MENAR, ARNOLD, B.; JENKINS, DAVID
CORP AUTH CALIFORNIA UNIV., RICHMOND. SANITARY ENGINEERING RESEARCH LAB.

AVAIL ENVIRONMENTAL SCIENCE AND TECHNOLOGY, VOL 4, NO 12, P 1115-1121, DECEMBER 1970. 6 TAB, 6 FIG, 12 REF.

TITLE FEDERAL ASSISTANCE PROJECT METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1. OCTOBER 1969 - FEBRUARY 1970.
AUTHOR HEGG, BOB A.; BURGESON, JOHN R.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, KANSAS CITY, MO.
AVAIL MARCH 1971, 42 P, 5 TAB, 6 FIG, 12 REF.

TITLE FULL SCALE OPERATION OF PLUG FLOW ACTIVATED SLUDGE SYSTEMS.
AUTHOR BEER, C.; HETLING, L. J.; WANG, L. K.
CORP AUTH NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY; AND RENSSELAER POLYTECHNIC INST., TROY.
AVAIL NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION, TECHNICAL REPORT NO 42, AUG 1975, PRESENTED AT THE NEW ENGLAND WATER POLLUTION CONTROL ASSOCIATION MEETING, HARTFORD, CONN., OCTOBER 23, 1974, 45 P, 13 FIG, 7 TAB, 16 REF. EPA PROJECT 17050 EDL.

TITLE INDUSTRIAL WASTE PROCESS DESIGN.
AUTHOR ECKENFELDER, W. W., JR.; O'CONNER, D. J.
CORP AUTH MANHATTAN COLL., BRONX, NY. DEPT. OF CIVIL ENGINEERING.
AVAIL PROCEEDINGS AMERICAN SOCIETY OF CIVIL ENGINEERS, FEBRUARY 15-19, 1954, SANITARY ENGINEERING DIVISION, VOL 80, NO 411, P 411-1 TO 411-25. 13 FIG, 5 TAB, 26 REF.

TITLE INFLUENCE OF ACTIVATED SLUDGE CRT ON ADSORPTION.
AUTHOR KIM, B. R.; SNOEYINK, V. L.; SAUNDERS, F. M.
CORP AUTH ILLINOIS UNIV. AT URBANA-CHAMPAIGN, DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION PROCEEDINGS OF ASCE, VOL 102, NO EE1, P 55-70, FEBRUARY, 1976. 12 FIG, 2 TAB, 21 REF, 1 APPEND.

TITLE THE INFLUENCE OF PH AND ORGANIC LOADING ON THE FILAMENTATOUS BULKING OF ACTIVATED SLUDGE.
AUTHOR YASUDA, M.
CORP AUTH TOYAMA COLL. OF TECH. (JAPAN). DEPT. OF SANITARY ENGINEERING.
AVAIL TRANSACTIONS OF THE JAPAN SOCIETY OF CIVIL ENGINEERS, VOL 8, P 131-132, 1976. 5 FIG, 1 TAB.

TITLE INSTANTANEOUS METERING AIDS - ACTIVATED SLUDGE PLANT.
AUTHOR MATZNER, B. A.
CORP AUTH SUFFOLK COUNTY DEPT. OF ENVIRONMENTAL CONTROL, HAUPPAUGE, NY OPERATIONS DIV.
AVAIL WATER AND WASTES ENGINEERING, VOL 13, NO 8, P 18-20, AUGUST, 1976.

TITLE INTRODUCTION TO WASTEWATER TREATMENT PROCESSES.
AUTHOR RAMALHO, R. S.
CORP AUTH LAVAL UNIV., QUEBEC.
AVAIL ACADEMIC PRESS (NEW YORK, SAN FRANCISCO, LONDON). 1977. 409 P.

TITLE INVENTORY OF ENERGY USE IN WASTEWATER SLUDGE TREATMENT AND DISPOSAL.
AUTHOR SMITH, J. E.
AVAIL INDUSTRIAL WATER ENGINEERING, VOL 14, NO 4, P 20-26, JULY/AUGUST, 1977. 12 FIG, 10 TAB.

TITLE A KINETIC MODEL FOR DESIGN OF COMPLETELY-MIXED ACTIVATED SLUDGE TREATING VARIABLE-STRENGTH INDUSTRIAL WASTEWATERS.
AUTHOR ADAMS, C. E.; ECKENFELDER, W. W.; HOVIOUS, J. C.
CORP AUTH ASSOCIATED WATER AND AIR RESOURCES ENGINEERS, INC., NASHVILLE, TENN.
AVAIL WATER RESEARCH, VOL 9, NO 1, P 37-42, JANUARY 1975. 4 FIG, 1 TAB, 5 REF.

TITLE LEAST COST DESIGN OF ACTIVATED SLUDGE SYSTEMS.
AUTHOR MIDDLETON, A. C.; LAWRENCE, A. W.
CORP AUTH CORNELL UNIV., ITHACA, NY DEPT. OF ENVIRONMENTAL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 5, P 889-905 MAY 1976. 11 FIG, 11 TAB, 17 REF.

TITLE LOAD BALANCING AT SEWAGE-TREATMENT WORKS: THE SOUTHAMPTON UNIVERSITY PILOT PLANT AT MILLBROOK.
AUTHOR HELLIWELL, P. R.; REED, R. J. R.
CORP AUTH SOUTHAMPTON UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL OF THE INSTITUTE OF WATER POLLUTION CONTROL, VOL 76, NO 3, P 355-372, 1977. 14 FIG, 2 TAB, 10 REF.

TITLE LONG-TERM PERFORMANCE OF A COUPLED TRICKLING FILTER-ACTIVATED SLUDGE PLANT.
AUTHOR STENQUIST, R. J.; PARKER, D. S.; LOFTIN, W. E.; BRENNER, R. C.
CORP AUTH BROWN AND CALDWELL, WALNUT CREEK, CA
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 1, P 2265-2284, NOVEMBER, 1977. 15 FIG, 10 TAB, 8 REF.

TITLE MANY DESIGN PROBLEMS OVERCOME IN STATEN ISLAND PLANT.
AUTHOR MITCHELL, R. D.
CORP AUTH PIRNIE (MALCOLM), INC., WHITE PLAINS, NY
AVAIL WATER AND WASTES ENGINEERING, VOL 13, NO 12, P 57-59, 68, DECEMBER, 1976. 1 FIG, 1 TAB.

TITLE METHOD FOR MEASURING AEROBIC DECOMPOSITION ACTIVITY OF ACTIVATED SLUDGE IN AN OPEN SYSTEM.
AUTHOR FARKAS, PETER
CORP AUTH RESEARCH INST. FOR WATER RESOURCES DEVELOPMENT, BUDAPEST (HUNGARY).
AVAIL FOURTH INTERNATIONAL CONFERENCE ON WATER POLLUTION RESEARCH, PRAGUE, CZECH., SEPTEMBER 2-6, 1968. PREPRINT, SEC, II, PAPER 1, 9 P, 6 FIG, 1 TAB, 15 REF.

TITLE MICROBIOLOGY OF WASTE TREATMENT
AUTHOR UNZ, R. F.
CORP AUTH PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 45, NO 6, P 1259-1265, JUNE 1973, 67 REF.

TITLE MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW).
AUTHOR UNZ, R. F.
CORP AUTH PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 6, P 1255-1268, JUNE, 1977. 130 REF.

TITLE MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW).
AUTHOR UNZ, F. F.
CORP AUTH PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 6, P 1367-1378, JUNE, 1976. 101 REF.

TITLE MICROSCOPIC OBSERVATION OF ACTIVATED SLUDGE APPLIED TO THE MONITORING OF TREATMENT PLANTS (L'OBSERVATION MICROSCOPIQUES DES BOUES ACTIVEES APPLIQUE A LA SURVEILLANCE DES INSTALLATIONS D'EPURATION: TECHNIQUE D'ETUDE INTERPRETATION).
AUTHOR DRAKIDES, C.
CORP AUTH MONTPELLIER-2 UNIV. (FRANCE). LAB. DE GENIE CHIMIQUE, TRAITEMENT ET EPURATION DES EAUX.
AVAIL TECHNIQUES ET SCIENCES MUNICIPALES-1 EAU, VOL 73, NO 2, P 85-98, FEBRUARY, 1978. 18 FIG, 16 REF.

TITLE MODELING AND OPTIMIZATION OF STEP AERATION WASTE TREATMENT SYSTEMS.
AUTHOR ERICKSON, LARRY E.; HO, Y. S.; FAN, L. T.
CORP AUTH KANSAS STATE UNIV., MANHATTAN.
AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 5, PART 1, P 717-732, MAY 1968. 6 FIG, 2 TAB, 5 REF.

TITLE MODULES PERMIT EASY EXPANSION.
AUTHOR WEAVER, J. H.
CORP AUTH ROBERT AND CO. ASSOCIATES, WEST PALM BEACH, FLA.
AVAIL WATER ANMD WASTES ENGINEERING, VOL 13, NO 11, P 73-74, NOVEMBER, 1976, 1 FIG.

TITLE NEW SYSTEM PUTS THE WOOD TO WASTEWATER.
AUTHOR WEBER, C. L.; JACOBSON, C. D.
CORP AUTH KIRKHAM MICHAEL AND ASSOCIATES, OMAHA, NEBR.
AVAIL WATER AND WASTES ENGINEERING, VOL 12, NO 12, P 51-52, 64, DECEMBER, 1975. 1 FIG.

TITLE NITRIFICATION AND HEAVY METAL REMOVAL IN THE ACTIVATED SLUDGE TREATMENT PROCESS.
AUTHOR RICHARDS, P. A.
CORP AUTH TEXAS A AND M UNIV., COLLEGE STATION.
AVAIL UNIVERSITY MICROFILMS, INC., ANN ARBOR, MICH., 48106. ORDER NO. 77-2662. PHD THESIS, 1976. 182 P.

TITLE NITRIFICATION IN ACTIVATED SLUDGE PLANTS - GUIDELINES ON SOME OPERATION AND DESIGN ASPECTS.
AUTHOR SMITH, A. G.
CORP AUTH ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. WASTEWATER TREATMENT SECTION.
AVAIL RESEARCH PUBLICATION, W62, 1976. REVISED JULY 1977, 97 P, 17 FIG, 12 TAB, 66 REF.

183

TITLE NITRIFICATION IN HIGH-SLUDGE AGE CONTACT STABILIZATION.
AUTHOR ZOLTEK, J., JR.; LEFEBVRE, L.
CORP AUTH FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 9, P 2183-2189, SEPTEMBER, 1976. 4 FIG, 1 TAB, 11 REF.

TITLE NITRIFICATION IN TREATMENT PLANTS AND NATURAL WATERS: SOME IMPLICATIONS OF THE THEORETICAL MODELS.
AUTHOR DOWNING, A. L.; KNOWLES, G.
CORP AUTH WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
AVAIL FIFTH INTERNATIONAL WATER POLLUTION RESEARCH CONFERENCE, SAN FRANCISCO, JULY 26-AUGUST 1, 1970. PREPRINT, PAPER I-8, 8 P, 4 FIG, 1 TAB, 6 REF.

TITLE NITROGEN REMOVAL AND IDENTIFICATION FOR WATER QUALITY CONTROL.
AUTHOR CARLSON, DALE A.
CORP AUTH WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
AVAIL NATIONAL TECHNICAL INFORMATION SERVICE AS PB-204 231, $3.00 IN PAPER COPY, $0.95 IN MICROFICHE, AUGUST 15, 1971. 52 P, 12 FIG, 8 TAB, 85 REF. OWRR A-040-WASH(1).

TITLE ONE-VERSUS TWO-STATE NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS.
AUTHOR STOVER, E. L.; KINCANNON, D. F.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER. SCHOOL OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 4, P 645-651, APRIL, 1976. 6 FIG, 17 REF.

TITLE OPERATING ACTIVATED-SLUDGE PLANTS TO EFFECT NUTRIENT REMOVAL.
AUTHOR NICHOLLS, H. A.
AVAIL WATER POLLUTION CONTROL, VOL 77, NO 1, P 99-101, 1978.

TITLE OPERATING EXPERIENCE AND DESIGN CRITERIA FOR "UNOX" WASTEWATER TREATMENT SYSTEMS, DESIGN SEMINAR FOR WASTEWATER TREATMENT FACILITIES.
CORP AUTH UNION CARBIDE CORP., TONAWANDA, NY LINDE DIV.

AVAIL REPORT PREPARED FOR ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC, TECHNOLOGY TRANSFER PROGRAM, FOR SEMINAR AT NEW YORK, NY, FEBRUARY 29-MARCH 2, 1972. 68 P.

TITLE OPERATION OF CONVENTIONAL ACTIVATED SLUDGE FOR MAXIMUM PHOSPHORUS REMOVAL.
AUTHOR MILBURY, WILLIAM F.; MCCAULEY, DONALD; HAWTHORNE, CHARLES H.
CORP AUTH WESTON (ROY F.), INC., WEST CHESTER, PA.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 43, NO 7, JULY 1971, P 1890-1901. 3 FIG, 3 TAB, 7 REF.

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS. PART III-B. CALCULATION PROCEDURES FOR STEP-FEED PROCESS RESPONSES.
AUTHOR WEST, A. W.
CORP AUTH NATIONAL FIELD INVESTIGATIONS CENTER-CINCINNATI, OH.
AVAIL REPORT, 1975. 31 P, 7 FIG, 2 TAB.

TITLE OPTIMIZATION OF THE ACTIVATED SLUDGE PROCESS-OPTIMUM VOLUME RATIO OF AERATION AND SEDIMENTATION VESSELS.
AUTHOR NAITO, M.; TAKAMATSU, T.; FAN, L. T.
CORP AUTH KANSAS UNIV., LAWRENCE. DEPT. OF CHEMICAL AND PETROLEUM ENGINEERING; AND KYOTO UNIV. (JAPAN). DEPT.
AVAIL WATER RES, VOL 3, NO 6, P 433-443, JUNE 1969. 8 FIG, 6 REF.

TITLE OPTIMIZE THE EFFLUENT SYSTEM. PART 6: BIOCHEMISTRY OF ACTIVATED SLUDGE PROCESS.
AUTHOR GRUTSCH, J. F.; MALLATT, R. C.
CORP AUTH STANDARD OIL CO. (INDIANA), CHICAGO, IL.
AVAIL HYDROCARBON PROCESSING, VOL 55, NO 8, P 137-142, AUGUST, 1976. 7 FIG, 2 TAB, 15 REF.

TITLE THE ORBAL EXTENDED AERATION ACTIVATED SLUDGE PLANT.
AUTHOR DREWS, R. L. C.; MALAN, W. M.; MEIRING, P. G. J.; MOFFATT, B.
CORP AUTH NATIONAL INST. FOR WATER RESEARCH, PRETORIA (SOUTH AFRICA).
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 44, NO 2, FEBRUARY 1972, P 221-231, 6 FIG, 5 TAB, 4 REF.

TITLE ORGANIC MATTER REMOVAL BY POWDERED ACTIVATED CARBON ADDED TO ACTIVATED SLUDGE
AUTHOR DEWALLE, F. B.; CHIAN, E. S. K.; SMALL, E. M.
CORP AUTH ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 4, P 593-599, APRIL, 1977. 5 FIG, 1 TAB, 19 REF.

TITLE OXYGEN-ACTIVATED SLUDGE PLANT COMPLETES TWO YEARS OF SUCCESSFUL OPERATION.
AUTHOR MCDOWELL, C. S.; GIANELLI, J.
CORP AUTH AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-272 271, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-77-040, JULY 1977. 195 P, 75 FIG, 12 TAB, 9 REF, 2 APPWEND.

TITLE OXYGEN AERATION AT NEWTON CREEK.
AUTHOR NASH, N.; KRASNOFF, P. J.; PRESSMAN, W. B.; BRENNER, R. C.
CORP AUTH NEW YORK STATE DEPT. OF WATER RESOURCES, NEW YORK.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 3, P 388-400, MARCH 1977, 4 FIG, 6 TAB, EPA PROJECT 11010 GEV.

TITLE PHOSPHORUS REMOVAL WITH PICKLE LIQUOR IN AN ACTIVATED SLUDGE PLANT.
CORP AUTH MILWAUKEE SEWERAGE COMMISSION, WIS.
AVAIL GPO SUP DOC. $1.25; MICROFICHE FORM NTIS AS PB-208 216, $0.95. ENVIRONMENTAL PROTECTION AGENCY WATER POLLUTION CONTROL RESEARCH SERIES, MARCH 1971. 143 P, 25 FIG, 7 TAB, 19 REF. EPA PROGRAM 11010 FLQ--03/71.

TITLE PHYSICAL CONDITIONING OF ACTIVATED SLUDGE FLOC.
AUTHOR PARKER, DENNY S.; KAUFMAN, WARREN J.; JENKINS, DAVID.
CORP AUTH CALIFORNIA UNIV., BERKELEY.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 43, NO 9, P 1817-1833, SEPTEMBER 1971. 14 FIG, 6 TAB, 25 REF.

TITLE PLANT DATA ANALYSIS OF TEMPERATURE SIGNIFICANCE IN THE ACTIVATED SLUDGE PROCESS.
AUTHOR LIN, K-C.; HEINKE, G. W.
CORP AUTH NEW BRUNSWICK UNIV., FREDERICKTON. DEPT. OF CIVIL ENGINEERING.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 2, P 286-295, FEBRUARY, 1977. 4 FIG, 3 TAB, 18 REF, 1 APPEND.

TITLE POLLUTION ABATEMENT IN A BREWING FACILITY.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC, TECHNOLOGY TRANSFER STAFF.
AVAIL EPA TECHNOLOGY TRANSFER CAPSULE REPORT NO. 6, (1974). 17 P, 8 FIG, 6 TAB.

TITLE POLYMER ADDITION IMPROVES WASTE WATER TREATMENT PROCESS.
AUTHOR CHURCHILL, R. J.; RYBACKI, R. L.
CORP AUTH PETROLITE CORP., ST. LOUIS, MO. TRETOLITE DIV.
AVAIL WATER AND SEWAGE WORKS, REFERENCE ISSUE, P 10-12, 14-17, 20, APRIL, 1977. 8 FIG, 2 TAB, 5 REF.

TITLE PROCESS CONTROL OF ACTIVATED SLUDGE TREATMENT.
AUTHOR KERMODE, R. I.; BRETT, R. W. J.
CORP AUTH KENTUCKY WATER RESOURCES INST., LEXINGTON.
AVAIL NTIS AS PB-227 238 $4.00 IN PAPER COPY, $1.45 IN MICROFICHE. RESEARCH REPORT NO 63, 1973. 88 P, 18 FIG. 40 REF, 9 TAB. OWRB(1) A-040-KY. 14-31-0001-3517. 14-31-0001-3817.

TITLE PROCESS CONTROL OF ACTIVATED SLUDGE TREATMENT, PHASE II.
AUTHOR KERMODE, R. I.; BRETT, R. W. J.; PAULT, J. D., JR.
CORP AUTH KENTUCKY WATER RESOURCES INST., LEXINGTON.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-240 176, $4.75 IN PAPER COPY, $2.25 IN MICROFICHE. RESEARCH REPORT NO. 83, JANUARY 1975. 87 P, 29 FIG, 14 TAB, 14 REF. OWRT A-050-KY(1). 14-31-0001-4017.

TITLE PROCESS DESIGN MANUAL FOR UPGRADING EXISTING WASTEWATER TREATMENT PLANTS.
CORP AUTH WESTON (ROY F.), INC., WEST CHESTER, PA
AVAIL EPA REGIONAL OFFICE TECHNOLOGY TRANSFER; IN MICROFICHE FROM NTIS AS PB-214 550 FOR $1.45. ENVIRONMENTAL PROTECTION AGENCY, TECHNOLOGY TRANSFER MANUAL, OCTOBER 1971, 275P. EPA PROJECT 17090 GNQ, CONTRACT 14-12-933.

TITLE PROCESS OPTIMA IN ACTIVATED SLUDGE.
AUTHOR POLOCSIK, S.; GRIEVES, R. B.; PIPES, W. O. JR.
CORP AUTH ILLINOIS INST. OF TECH., CHCAGO.

AVAIL PROCEEDINGS, INDUSTRIAL WASTE CONFERENCE, 20TH, MAY 4, 5, 6, 1965, PURDUE UNIVERSITY, VOL XLIX, NO 4, P 197-209, JULY 1965. 5 FIG, 1 TAB, 4 REF. PUBLIC HEALTH SERVICE TRAINING GRANT NO 5T1ES26-02.

TITLE PROCESS STABILITY OF ACTIVITY SLUDGE PROCESSES.
AUTHOR CHIANG, C. H.
CORP AUTH PIRNIE (MALCOLM), INC., WHITE PLAINS, NY
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION-ASCE, VOL 103, NO EE2, P 259-271, APRIL, 1977. 3 FIG, 3 TAB, 2 APPEND.

TITLE ROLE OF NITROGEN IN ACTIVATED SLUDGE PROCESS.
AUTHOR WU, Y. C.
CORP AUTH PITTSBURGH UNIV., PA. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL 102, NO EE5, PROCEEDINGS PAPER NO 12454, P 897-907, OCTOBER 1976.

TITLE SECONDARY TREATMENT.
AVAIL IN: 1977 PUBLIC WORKS MANUAL AND CATALOG FILE, BILLINGS, C. H., CONNER, S. H., AND KIRCHER, J. R., EDITORS, P D24-D32, 1977. 1 FIG.

TITLE SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE.
AUTHOR REED, SHERWOOD
CORP AUTH COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
AVAIL NTIS AS AD-717 239, $3.00 IN PAPER COPY, $0.95 IN MICROFICHE. CRREL TECHNICAL REPORT 203, NOV 1970. 30 P, 17 FIG, 5 TAB, 25 REF.

TITLE SEWAGE TREATMENT WORKS FOR SMALL COMMUNITIES--A NEED FOR CAREFUL DESIGN AND OPERATION.
AUTHOR DREWS, R. J. L. C.; DENYSSCHEN, J. H.
CORP AUTH NATIONAL INST. FOR WATER RESEARCH, PRETORIA (SOUTH AFRICA).
AVAIL IN: WATER POLLUTION CONTROL IN DEVELOPING COUNTRIES. PROCEEDINGS OF THE INTERNATIONAL CONFERENCE HELD AT BANGKOK, THAILAND, FEBRUARY 1978. EDITED BY E.A.R. OUANO, B. M. LOHANI, | N. C. THANH. ASIAN INSTITUTE OF TECHNOLOGY, BANGKOK, THAILAND (PERGAMON PRESS IN USA), P 381-397, 1978, 7 FIG, 1 TAB, 9 REF.

TITLE SHOCK LOAD RESPONSE OF ACTIVATED SLUDGE WITH CONSTANT RECYCLE SLUDGE CONCENTRATION.
AUTHOR SALEH, M. M.; GAUDY, A. F., JR.
CORP AUTH EL-AZHAR UNIV., CAIRO (EGYPT). SCHOOL OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 50, NO 4, P 764-774, APRIL, 1978. 190 FIG, 1 TAB, 11 REF.

TITLE SIMPLIFIED OPTIMIZATION OF ACTIVATED SLUDGE PROCESS.
AUTHOR GRADY, C. P. L., JR.
CORP AUTH PURDUE UNIV., LAFAYETTE, INDIANA, SCHOOL OF CIVIL ENGINEERING.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL 103, NO EE3, PROCEEDINGS PAPER NO. 12974, P 413-429, JUNE 1977. 3 FIG, 6 TAB, 19 REF.

TITLE START-UP OF NEW WASTE WATER TREATMENT PLANTS.
AUTHOR CAVERLY, D. S.
CORP AUTH ONTARIO WATER RESOURCES COMMISSION, TORONTO
AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 4, P 571-580, APRIL 1968.

TITLE SYSTEM ALTERNATIVES IN OXYGEN ACTIVATED SLUDGE.
AUTHOR STAMBERG, J. B.; BISHOP, D. F.; BENNETT, S. M.; HAIS, A. B.
CORP AUTH DISTRICT OF COLUMBIA DEPT. OF ENVIRONMENTAL SERVICES, WASHINGTON.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161, AS PB-241 310, $4.25 IN PAPER COPY, $2.25 in MICROFICHE. ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO. REPORT EPA-670/2-75-008, APRIL 1975. 59 P, 22 FIG, 7 TAB, 26 REF. 1BB043 ROAP 21-ASR TASK-015 68-01-0162.

TITLE TECHNICAL ASSISTANCE PROJECT FORT COLLNS WASTEWATER TREATMENT FACILITY FORT COLLINS, COLORADO, JANUARY - FEBRUARY, 1973.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY DENVER, CO. REGION VIII.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-255 573, IN PAPER COPY, IN MICROFICHE. REPORT S AND A/TSB - 22, 1973 25 P, 4 FIG.

TITLE TECHNICAL ASSISTANCE PROJECT VAIL WASTEWATER TREATMENT FACILITY VAIL, COLORADO, MARCH - APRIL 1973.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, DENVER, CO. REGION VIII.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-255 257, IN PAPER COPY, IN MICROFICHE. REPORT SA/TSB-21, 1973. 31 P, 4 FIG, 2 REF.

TITLE TEMPERATURE EFFECTS ON THE ACTIVATED SLUDGE PROCESS.
AUTHOR SAYIGH, B. A.; MALINA, J. F., JR.
CORP AUTH TEXAS UNIV. AT AUSTIN. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 50 NO 4, P 678-687, APRIL, 1978. 13 FIG, 18 REF.

TITLE TEMPERATURE EFFECTS ON GROWTH AND YIELD OF ACTIVATED SLUDGE.
AUTHOR FRIEDMAN, A. A.; SCHROEDER, E. D.
CORP AUTH TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 44, NO 7, P 1433-1442, JULY 1972, 8 FIG, 3 TAB, 25 REF.

TITLE TOWARD A MORE MEANINGFUL INDEX OF SLUDGE QUALITY.
AUTHOR FITCH, B.; KOS, P.
CORP AUTH CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 8, P 1979-1987, AUGUST, 1976. 11 FIG, 1 REF.

TITLE TRACE ELEMENTS IN BIOLOGICAL WASTE TREATMENT IWTH SPECIFIC REFERENCE TO THE ACTIVATED SLUDGE PROCESS.
AUTHOR WOOD, D. K.; TCHOBANOGLOUS, G.
CORP AUTH CALIFORNIA UNIV., DAVIS.
AVAIL IN: PROCEEDINGS OF THE 29TH INDUSTRIAL WASTE CONFERENCE, MAY 7-9, 1974, PART 2, LAFAYETTE, INDIANA, PURDUE UNIVERSITY, P 648-661. 4 FIG, 6 TAB, 21 REF.

TITLE TRICKLING FILTER VERSUS ACTIVATED SLUDGE: WHEN TO SELECT EACH PROCESS.
AUTHOR KINCANNON, D. F.; SHERRARD, J. H.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER, SCHOOL OF CIVIL ENGINEERING.

AVAIL WATER AND SEWAGE WORKS, VOL 121, NO 4, P 32-34, 36 APRIL 30, 1974. 1 FIG, 4 TAB, 9 REF.

TITLE UNIFIED BASIS FOR BIOLOGICAL TREATMENT DESIGN AND OPERATION.
AUTHOR LAWRENCE, ALONZO W.; MCCARTY, PERRY L.
CORP AUTH STANFORD UNIV., CALIF.
AVAIL JOURNAL, SANITARY ENGINEERING DIVISION, PROCEEDINGS AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL 96, NO SA3, P 757-778, JUNE 1970. 4 FIG, 6 TAB, 48 REF.

TITLE WASTEWATER CHARACTERIZATION AND PROCESS RELIABILITY FOR POTABLE WASTEWATER RECLAMATION.
AUTHOR PETRASEK, A. C., JR.
CORP AUTH DALLAS WATER UTILITIES DEPT., TX.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-274 874, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-77-210, 1977. 124 P, 56 FIG, 22 TAB, 10 REF.

TITLE WASTEWATER TREATMENT DESIGN: ECONOMICS AND TECHNIQUES, PART I.
AUTHOR ECKENFELDER, W. W., JR.
CORP AUTH VANDERBILT UNIV., NASHVILLE, TENN.
AVAIL WATER AND SEWAGE WORKS, VOL 122, NO 6, P 63-65, JUNE, 1975. 67 FIG, 2 TAB.

TITLE WASTEWATER TREATMENT DESIGN, PART II.
AUTHOR ECKENFELDER, W. W., JR.
CORP AUTH VANDERBILT UNIV., NASHVILLE, TENN.
AVAIL WATER AND SEWAGE WORKS, VOL 122, NO 7, P 70, 75, JULY, 1975. 2 FIG, 1 TAB, 3 REF.

TITLE WASTEWATER TREATMENT PROBLEMS AT NORTH KANSAS CITY, MISSOURI.
AUTHOR SCHMIDT, P. J.
CORP AVAIL BLACK AND VEATCH, KANSAS CITY, MO
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 50, NO 4, P 635-644, APRIL, 1978. 5 FIG, 3 TAB.

TITLE WATER AND WASTEWATER TREATMENT.
AUTHOR SCHROEDER, E. D.
CORP AUTH CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
AVAIL MCGRAW-HILL, NEW YORK, NY 1977, 370 P. $3.95.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980--657-165/0059

Key Points & Instructor Guide

Use Slide 179.2/11.3.4
Slide 179.2/11.3.4 is a schematic flow diagram of an extended aeration facility

Comment on problems caused by not having a primary clarifier

D. Step Feed

1. Use step feed diagram to illustrate how mode change can be used in problem solving.

2. Step feed can be varied from conventional to contact mode. Use slide to show how this change is accomplished.

3. By increasing or decreasing the tank volume used for sludge reaeration the sludge inventory and sludge aeration time can be varied over wide ranges.

4. Conditions which might indicate mode change (assume that system is being operated in conventional mode before change is affected):

   a. Sudden increase in hydraulic load (storm water run-off) - change to contact mode to protect sludge inventory.

   b. Sludge begins to settle slowly and RR begins to increase - change to sludge reaeration mode to increase sludge inventory and sludge aeration time. Cause sludge to become more stable, settle faster and lower RR.

   c. Troubleshooter may see system as an extreme problem - very slow settling sludge spilling over weirs or severely over-oxidized sludge which has deflocculated and losing excess solids. Mode changes offer quick response to correct these conditions.

Key Points & Instructor Guide

Use Slide 179.2/11.3.5
Slide 179.2/11.3.5 is a schematic flow diagram of a step feed activated sludge plant

E. Other Variations

1. Complete Mixing

   a. Complete mixing provides some protection against "shock" or "slug" loads.

   b. Operating parameters

      1) F/M: 0.2-0.6 #BOD5/#MVLSS/day

      2) Aerator Loading: 50-120 #BOD5/1000 ft^3

      3) MLSS: 3000-6000 mg/l

      4) Detention Time: 3-5 hours

      5) MCRT: 5-15 days

      6) Return sludge flow rate: 25-100% of influent

   c. Higher loadings tend to produce a slower settling sludge than conventional processes but otherwise the operation is similar.

2. Oxidation Ditch-an extended aeration plant with an "oval doughnut" aeration basin configuration. Brush aerators are used to circulate mixed liquor around the aeration basin. Sometimes called a "Dutch Ditch" or "Race Track".

3. Tapered aeration - a conventional plug flow plant with the air application tapered from the head of the plant (high oxygen demand zone and higher aeration rate) to the effluent end of the tank (low oxygen demand zone and lower aeration rate).

Key Points & Instructor Guide

Use Slide 179.2/11.4.5
Slide 179.2/11.4.5 is a schematic diagram of the complete mixing activated sludge process

Use Slide 179.2/11.3.6
Slide 179.2/11.3.6 is a blank

Refer class to Field Manual for Performance Evaluation and Troubleshooting at Municipal Wastewater Treatment Facilities, page 57.

III. Examples of Mode Change for Process Trouble shooting (5 minutes)

A. Ask class to cite examples from their experience of mode changes used for process control or troubleshooting.

B. Discuss class inputs

C. Instructor should be prepared to cite examples if class does not offer examples.

Key Points & Instructor Guide

Example of Mode Change for Process Troubleshooting and Operational Control. (Example is based on the experiences of the Operational Technology Branch, National Training and Operational Technology Center, U.S. Environmental Protection Agency, Cincinnati, Ohio).

1. Plant design is about 2 MGD

2. Plant has two aeration basins which can be operated

   a. In series, plug flow

   b. In parallel

   c. One tank on-line, one tank off-line

   d. One tank as "Contact basin" and one tank as "reaeration basin"

3. Large portion of raw waste comes from a large bakery which discharges a high carbohydrate waste with high grease and oil content.

4. Plant has constant slow settling (bulking) sludge problems when aeration basins are operated in series or in parallel. Solids cannot be retained in the system.

5. By operating with one tank as a contact tank and the other as a reaeration tank, the solids could be retained and stabilized. However, prolonged operation in this mode resulted in over-oxidation of the sludge producing a fast settling sludge which left a turbid effluent which exceeded TSS standards.

6. Plant personnel were taught to monitor sludge settling characteristics and to switch the plant from the "reaeration operating mode" to an operating mode with the aeration tanks in parallel when sludge settling began to increase. As settling rates became slower, the plant was switched back to the "reaeration" mode.

7. The plant operated for over a year using mode change to control sludge quality and consistently produced a high quality effluent which exceeded NPDES permit requirements.

Training Sample 12
"Unit 11: Activated Sludge, Instructor Notebook"
TROUBLESHOOTING O & M PROBLEMS IN WASTEWATER TREATMENT FACILITIES
NTOTC
Cincinnati, Ohio 45268
December 1979

Lesson 7 of 14 lessons
Recommended Time: 90 minutes

Purpose: Four major process control decision making tools, F/M, MCRT, Sludge Settleability and RR, are used in activated sludge process control, evaluation and troubleshooting. Many operators and troubleshooters routinely use only one or two of these tools and, therefore, attempt to control the process based on limited or partial information. The problem solving exercise in this lesson requires the trainee to solve a generalized process control problem, identify the possible causes of the problem, describe how the actual problem cause would be determined and recommend corrective actions for each possible cause identified. The exercise forces the trainee to look at the interrelationships between the various process control decision making tools.

Trainee Entry Level Behavior: Trainees should have achieved the learning objectives specified for Unit 11, Lessons 1 - 6 before beginning this lesson.

Trainee Learning Objectives: At the conclusion of this lesson, the trainee will be able to:

1. Given design information about a model activated sludge treatment plant, information that a change has occurred in one of the parameters F/M, MCRT, Sludge Settleability or RR and using Trainee Notebook references and class notes, list all possible causes of the observed change in the process control parameter, describe the expected change in other process control parameters which would confirm each possible cause as the most likely cause and list the recommended process control responses to each possible cause of the observed change in the process control parameter.

2. When called upon by the instructor, report his/her findings for the given conditions and justify his/her recommendations for process control responses.

3. Using class notes and Trainee Notebook references, explain why it is necessary to consider concurrent changes in at least four parameters, F/M, MCRT, Sludge Settleability and RR, when evaluating an activated sludge system to identify problems and their probable causes.

Instructional Approach: Trainee problem solving in work groups of four trainees and discussion of trainee findings.

Lesson Schedule: The 90 minutes allocated to this lesson should be scheduled as follows:

TIME	SUBJECT
0 - 10 minutes	Instructor Introduces the Problem
10 - 45 minutes	Trainee Problem Solving
45 - 85 minutes	Trainees Report Findings
85 - 90 minutes	Instructor Summarized Lesson

Trainee Materials Used in Lesson:

1. Trainee Notebook, page T11.7.1, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response - Problem Statement."

2. Trainee Notebook, page T11.7.4, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response - Instructions for Completing Worksheet."

3. Trainee Notebook, page T11.7.5 - T11.7.12, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response-Worksheets.

4. All trainee references and Trainee Notebook materials used in Unit 11, Lessons 1 - 6.

Instructor Materials Used in Lesson:

1. Instructor Notebook, Unit 11, Lesson 7, pages 11.7.1 -11.7.9.

2. Instructor Notebook, pages H11.7.1 - H11.7.37, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response" (to be reproduced and distributed to trainees at the conclusion of the lesson.)

Instructor Materials Recommended for Development: None

Additional Instructor References: As specified in Unit 11, Lessons 1 - 6.

Classroom Set-Up:

1. Lesson Introduction: As specified in Unit 11, Lessons 1.

2. Trainee Problem Solving: One separate breakout room for each trainee workgroup so that individual work groups have a private quiet area in which to meet and discuss the work group's assigned problem.

3. Trainees Report Findings: As specified in Unit 11, Lesson 1.

Lesson Outline

I. Instructor Introduces the Problem (10 minutes)

A. Introduction

1. Have discussed several process control and evaluation tools and their significance.

a. F/M

b. MCRT

c. Sludge Settleability

d. RR

2. Now its time to apply what has been covered to activated sludge process troubleshooting.

3. Do this by developing a series of process control and troubleshooting guides.

Key Points & Instructor Guide

Refer class to Trainee Notebook, pages T11.7.1-T11.7.11 for a statement of the problem, instructions and worksheets.

B. Have class read Problem Situation

1. Refer class to Trainee Notebook, page T11.7.1-T11.7.2 for a statement of the situation. Trainee Notebook pages T11.7.1-T11.7.11 are included in the Instructor Notebook.

2. Emphasize that the situation is designed to provide a maximum of process control flexibility which is available to the operator and troubleshooter. The specifics of plant design are really immaterial to this problem.

3. The objective is to provide specific guidelines to the operator on how to correctly use the available process flexibility to achieve and maintain good effluent quality.

C. Instructions for Completing the Problem Worksheets

1. Refer class to Trainee Notebook, pages T11.7.4 - T11.7.11, "Activated Sludge Process Troubleshooting, Problem Identification and Process Control Response Worksheets" and page T11.7.3 for "Instructions for Completing Worksheets". These pages are included in the Instructor Notebook.

2. Review instructions and worksheets with the class.

Key Points & Instructor Guide

Instructor should refer to pages H11.7.1-H11.7.37 which are the completed worksheets to gain a better understanding of the expected trainee responses to the worksheet exercise.

D. Make Worksheet Assignments

1. Assign worksheets to trainee workgroups for completion.

a. Trainee Group 1, page T11.7.4, F/M Increasing.

b. Trainee Group 2, page T11.7.5, F/M Decreasing.

c. Trainee Group 3, page T11.7.6, MCRT Increasing.

d. Trainee Group 4, page T11.7.7, MCRT Decreasing.

e. Trainee Group 5, page T11.7.8, MLSS RR Increasing.

f. Trainee Group 6, page T11.7.9, MLSS RR Decreasing.

g. Trainee Group 7, page T11.7.10, Settling Rate Increasing.

h. Trainee Group 8, page T11.7.11, Settling Rate Decreasing.

2. Each work group should complete its assigned worksheet by working as a team. Stress the importance of discussion within the group.

3. Work groups will have about 35 minutes to complete their assigned worksheets.

4. Inform work groups that when the class reconvenes, each work group will report its findings to the class and justify its recommendations.

E. Direct Work Groups to Their Work Areas

1. Separate work areas, preferably separate rooms, should be provided for each work group so that the group may freely discuss the assigned problem and develop a group concensus solution without interfering with the work of another group.

2. Assign a work area to each group and give directions for finding the assigned work area.

F. Answer any questions about the exercise before sending groups to their work areas.

II. Trainee Problem Solving (35 minutes)

A. Circulate among work groups to monitor progress and answer questions.

B. Review each work group's product periodically and redirect their efforts as necessary.

C. If a group completes the assigned work sheet early, assign a second work sheet to the group.

D. Periodically inform groups of time remaining.

E. Reconvene groups in the main classroom at the end of the 35 minute work period.

III. Trainees Report Findings (40 minutes)

A. Reconvene class in main classroom.

B. Have work groups report their findings.

1. Call on groups sequentially, beginning with Group 1, to report findings (allocate about 8 minutes per group).

a. Group 1 - F/M Increasing

b. Group 2 - F/M Decreasing

c. Group 3 - MCRT Increasing

d. Group 4 - MCRT Decreasing

e. Group 5 - MLSS RR Increasing

f. Group 6 - MLSS RR Decreasing

g. Group 7 - Settling Rate Increasing

h. Group 8 - Settling Rate Decreasing

2. Encourage class discussion as each possible cause is presented.

3. Using the suggested solutions on pages H11.7.1-H11.7.37, challenge groups to justify their recommendations as appropriate.

4. Note that there is overlap and commonality between the correct responses for the eight observed conditions given in the worksheets, e.g., a rising F/M will cause a decreasing settling rate and an increasing MLSS RR which could be associated with a decreasing MCRT. Therefore, several groups should identify the same probable causes, confirmation observations and control responses. Use this information to draw several groups into the discussion.

5. Distribute solutions to the class after discussion is complete.

Key Points & Instructor Guide

School Solutions
Refer to pages H11.7.1-H11.7.7

Refer to pages H11.7.8-H11.7.13

Refer to pages H11.7.14-H11.7.15

Refer to pages H11.7.16-H11.7.19

Refer to pages H11.7.20-H11.7.23

Refer to pages H11.7.24-H11.7.28

Refer to pages H11.7.29-H11.7.33

Refer to pages H11.7-34-H11.7.37

Reproduce pages H11.7.1 - H11.7.37 in sufficient quantity to distribute to the class.

A. Using one solution sheet, page T11.7.4, the F/M increasing case, point out that there were many things which could have caused this observation. Point out that the correct process control response was different for each possible cause of the problem although several other control responses could be made to reverse the observed increase in F/M if this were the only information available to the operator and troubleshooter.

B. Point out that by looking at the four control parameters, F/M, MCRT, Sludge Settleability and MLSS RR, together it is fairly easy to eliminate several possible causes and narrow the list to the one most likely cause.

C. After identifying the cause of the problem, a correct process control response decision can be made.

D. Emphasize the importance of looking at all available information about the process before making a process control decision and changing process control variables. Incorrect control responses can be made if only one parameter is considered. This may cause more problems that it solves.

E. Recommend that routine monitoring of F/M, MCRT, Sludge Settleability and process respiration rates be considered for all activated sludge plants. If it is practical (personnel and dollar resources available) to institute a comprehensive process control management system, the process can be controlled to produce good effluents consistently.

Training Sample 13
"Unit 11: Activated Sludge, Trainee Notebook"
TROUBLESHOOTING O & M PROBLEMS IN WASTEWATER TREATMENT FACILITIES
NTOTC
Cincinnati, Ohio 45268
December 1979

Trainee Notebook Contents

Problem Identification and Process Control
Response - Problem Statement T11.7.1

Flow Schematic for Use in Problem Solving. T11.7.3

Problem Identification and Process Control
Response - Instructions for Completing
Worksheet. T11.7.4

Problem Identification and Process Control
Response - Worksheets. T11.7.5

Activated Sludge Process Troubleshooting

Problem Identification and Process Control Response

Problem Statement

While attending a local operator association meeting, you are introduced to John Schmitt, superintendent at a new 10 MGD step feed activated sludge plant. John has heard that you are an expert in activated sludge process control and asks you to help him solve recurrent process control problems which have occurred at the new plant. The plant has been in operation about a year but has never consistently produced a good effluent.

John informs you that he was superintendent at the city's old trickling filter plant which was replaced by the new activated sludge plant about a year ago. John confesses that he knows very little about activated sludge treatment and process control. Everything he knows about process control in the plant he got from the O & M manual which was prepared by the design firm as the new plant was constructed. Because he knows little about activated sludge, John has mechanically followed the process control procedure outlined in the O & M manual but has never been able to get the plant to perform properly.

The plant design flow is 10 MGD. There are separate storm water and sewage collection systems. The raw sewage is pumped to the plant headworks from a large lift station which is equipped with one variable speed 5000 gpm, one constant speed 5000 gpm and one constant speed 3000 gpm raw sewage pumps activated by level controllers in the wet well. Preliminary treatment consists of bar screening, comminution, grit removal and flow measurment. The pretreated waste is fed to two circular primary clarifiers. The primary effluent from the two tanks discharges to a common channel which feeds the aeration basin. The aeration basin has step feed capability at the quadrant points in the four pass plug flow aeration tank. Mixed liquor is distributed to two circular final clarifiers. The final clarifier effluent is chlorinated before discharging to the river. The underflow from the two clarifiers discharges to a common return sludge wet well. There are two variable speed 5000 gpm return sludge pumps. All return sludge discharges to the first quadrant of the aeration basin. Return sludge flow is metered, and the return sludge flow can be varied from 1400 to 10,000 gpm. Waste activated sludge is pumped from the return sludge wet well to the primary clarifiers. The waste sludge pump is a 1500 gpm constant speed pump activated by a time clock mechanism. There have been no problems in solids handling.

John informs you that there are several industries in town which discharge to the plant and sometimes cause relatively large variations in hydraulic and organic load to the plant. The average daily flow to the plant is 9.0 MGD.

John always operates the plant in the conventional treatment mode with all influent wastewater and return sludge entering the first quadrant of the aeration basin. John normally operates with a constant return sludge flow rate of about 6 MGD and only varies the return rate if the sludge blanket in the final clarifier begins to fall or rise. A constant volume of sludge is wasted each day because the waste rate has not been changed from the wasting rate set by the engineer during plant start-up.

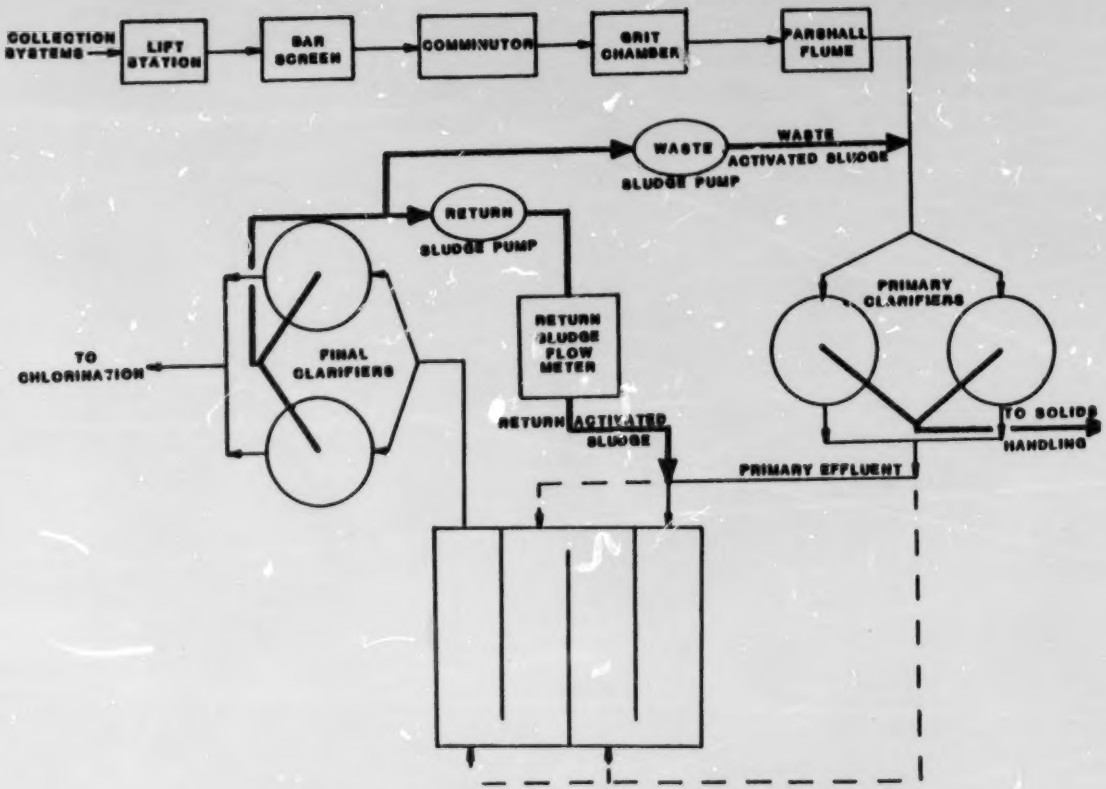
John tells you that plant performance is erratic. Sometimes the sludge bulks and washes out of the final clarifiers. Sometimes the sludge separates very well in the final clarifiers but leaves a turbid ashy type effluent. Sometimes the plant produces a good effluent but not very often. John is upset because he had been told that this plant would produce an excellent effluent and consistently meet his discharge permit requirement of 20 mg/l BOD and 20 mg/l TSS. But he can't seem to make the thing work.

John tells you that he has a well equipped laboratory and a good lab technician who's running all the tests specified in the O & M manual and the permit. John knows that these test results should be used in controlling the plant but he doesn't know what the test results mean or how to use them.

John wants you to teach him how to make the plant work. You decide to accept the job.

To accomplish the task, you decide to develop a series of process control and troubleshooting charts as work aids which John can use to help him interpret his process control laboratory data.

You will use the attached worksheets, pages T11.7.5 - T11.7.12 to develop the process control and troubleshooting charts. You and the members of your workgroup will be assigned one worksheet to complete. After you have completed your assigned worksheet, you will present the information from your worksheet to the class.



FLOW SCHEMATIC FOR USE IN PROBLEM SOLVING

Activated Sludge Process Troubleshooting

Problem Identification and Process Control Response

Instructions for Completing Worksheet

1. Prepare the worksheet in the context of the problem statement, i.e., a very flexible plant design which can accommodate many different process control adjustments in response to observed process conditions.

2. A change is observed in one process control parameter as specified at the top of the worksheet.

3. Possible Causes of Observed Condition. Possible Cause: List all things which could have occurred in the system to cause the change observed in the monitored parameter. Be as specific as possible. For example, if one possible cause for the observed condition is a change in applied load, specify the ways in which the load change could occur. Applied BOD load could increase because (a) the influent BOD concentration increases with flow remaining constant (b) the influent flow rate increases with the BOD concentration remaining constant, (c) both flow rate and BOD concentration increase, (d) an internal plant recycle stream is returned to the aeration basin, etc.

   Observations and Data to Confirm Cause: What additional observations and tests would you perform to confirm this as the cause of the problem and what result would you expect to see? For each possible cause, include the expected change in F/M, MCRT, Sludge Settleability and MLSS RR as your minimum entry in this column.

4. Process Control Response to Observed Condition. For each possible cause of the observed condition, enter the correct process control response. Process control responses should be considered as immediate or temporary (things to do right now to solve an immediate problem) and long term (things to be done which will correct the problem and prevent possible recurrence of the problem). For example, suppose the sludge settling rate decreases because of organic overload and the final clarifier sludge blanket becomes very high and solids wash-out from the clarifier is imminent. Then an immediate response may be to lower the sludge blanket by increasing return rate temporarily to prevent solids wash-out, but the long term solution to correct the problem may be to reduce return sludge rate and increase solids inventory. Be as exact and complete as possible in listing process control responses.

Activated Sludge Process Troubleshooting

Problem Identification and Process Control Response

Worksheet

PARAMETER MONITORED: F/M CONDITION OBSERVED: F/M Increasing

POSSIBLE CAUSES OF OBSERVED CONDITION:

Possible Cause	Observations and Data to Confirm Cause
1.	
2.	
3.	
4.	
5.	

PROCESS CONTROL RESPONSE TO OBSERVED CONDITION:

Possible Cause	Immediate or Temporary Response	Long Term Corrective Action
1		
2		
3		
4		
5		

Training Sample 14
"Unit 11: Activated Sludge, Instructor Handout"
TROUBLESHOOTING O & M PROBLEMS IN WASTEWATER TREATMENT FACILITIES
NTOTC
Cincinnati, Ohio 45268
December 1979

Instructor Handout Contents

Problem Identification and Process Control
Response - Answer Sheets . . . . . H11.7.1 - H11.7.37

Activated Sludge Process Troubleshooting

Problem Identification and Process Control Response

PARAMETER MONITORED: F/M
OBSERVED CONDITION: F/M Increasing

POSSIBLE CAUSES OF OBSERVED CONDITION:

Observations and Data to Confirm Cause

1. Settling rate - decreasing
   MLSS RR - increasing
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - increasing
   Influent Flow Rate - about the same
   Aeration Basin D.O. - decreasing

   Possible Causes - Increased organic load caused by increased influent BOD concentration with little change in influent flow rate

2. Settling rate - decreasing or no change
   MLSS RR - increasing or no change
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - increasing
   Influent Flow Rate - decreasing
   Aeration Basin D.O. - decreasing or about the same

   Possible Causes - Increased organic load caused by increased influent BOD concentration with a decrease in influent flow rate

3. Settling Rate - usually decreasing
   MLSS RR - increasing
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - about the same
   Influent Flow Rate - increasing
   Aeration Basin D.O. - decreasing

   Possible Causes - Increased organic load caused by increase in influent flow rate with little change in influent BOD concentration

4. Settling Rate - decreasing or no change
   MLSS RR - increasing or no change
   MCRT - Constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - decreasing
   Influent Flow Rate - increasing
   Aeration Basin D.O. - decreasing or about the same

   Possible Causes - Increased organic load caused by increase in influent flow rate with a decrease in influent BOD concentration

5. Settling Rate - Decreasing
   MLSS RR - increasing
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - increasing
   Influent Flow Rate - increasing
   Aeration Basin D.O. - decreasing

   Possible Causes - Increased organic load caused by increase in both influent BOD and influent flow rate

6. Settling Rate - decreasing
   MLSS RR - increasing
   MCRT - constant or slowly increasing
   Solids Inventory - constant or slowly increasing
   Fed Sludge RR - about the same if sample collected before recycle stream enters the aeration system
   - increasing if sample collected after recycle stream enters the aeration system
   Influent Flow Rate - about the same
   Aeration Basin D.O. - decreasing

   Possible Causes - Increased organic load caused by internal plant recycles

7. Settling Rate - decreasing
   MLSS RR - increasing
   MCRT - decreasing
   Solids Inventory - decreasing
   Fed Sludge RR - about the same
   Aeration Basin D.O. - increasing or about the same

   Possible Causes - Decrease in solids inventory caused by excessive deliberate wasting

8. Settling Rate - decreasing
   MLSS RR - increasing
   MCRT - decreasing
   Solids Inventory - decreasing
   Fed Sludge RR - about the same
   Influent Flow Rate - about the same
   Aeration Basin D.O. - increasing or about the same

   Possible Causes - Decrease in solids inventory caused by excessive effluent suspended solids

9. Settling Rate - no change
   MLSS RR - no change
   MCRT - no change
   Solids Inventory - no change
   Fed Sludge RR - no change or increasing
   Influent Flow Rate - about the same
   Aeration Basin D.O. - about the same

   Possible Causes - Nitrification occurring in BOD test used to measure applied load

PROCESS CONTROL RESPONSE TO OBSERVED CONDITIONS:

Possible Cause 1

1. Immediate or Temporary Response

   a. Check final clarifier sludge blanket depth.

      1. If the blanket is rising rapidly with possibility of solids washout, then temporarily increase return rate or waste rate to lower sludge blanket. Reduce return or waste rate as soon as blanket can be retained in final clarifier. CAUTION: Increased hydraulic load on clarifier may cause solids washout. This action may cause slow sludge settling problem to get worse before long range corrective actions affect process. This temporary response is a calculated risk!

      2. If the sludge blanket is not out of control, implement long term corrective actions.

   b. Check aeration basin D.O. If D.O. is less than 1 mg/l, increase air supply.

2. Long Term Corrective Action

   a. When sludge blanket can be retained in final clarifier, reduce return sludge flow rate-concentrates return sludge and increases aeration detention time.

   b. Reduce deliberate wasting to increase solids inventory and sludge aeration time. Continue to monitor F/M, sludge settleability and MLSS RR and balance system to new conditions of solids inventory and MCRT to treat increased load.

   c. If a and b don't work, then

      1. Increase aeration detention time by placing additional aeration basins into service.

      2. Increase sludge detention time by converting to sludge reaeration operating mode.

Possible Cause 2

1. Immediate or Temporary Response

   (Same as possible cause 1 responses)

2. Long Term Corrective Action

   a. If settling rate and MLSS RR are not changing, continue current operating practices but monitor settleability and MLSS RR frequently and respond to any changes which occur because of increased organic load.

   b. If settling rate is decreasing and MLSS RR is increasing, then implement corrective actions listed for possible cause 1.

Possible Cause 3

1. Immediate or Temporary Response

   (Same as possible cause 1 responses)

2. Long Term Corrective Actions

   (Same as possible cause 1 responses)

Possible Cause 4

1. Immediate or Temporary Response
   (Same as possible cause 1 responses)

2. Long Term Corrective Actions

   (Same as possible cause 2 reponses)

Possible Cause 5

1. Immediate or Temporary Response

   (Same as possible cause 1 responses)

2. Long Term Corrective Actions

   Same as possible cause 1 responses. Need to use additional aeration volume or sludge reaeration to handle new load is more likely for these influent load conditions.

Possible Cause 6

1. Immediate or Temporary Response
   a. Same as possible cause 1 responses

   b. Identify source of internal recycle and modify operations creating the internal recycle to eliminate or reduce the recycle, if possible

2. Long Term Corrective Actions

   a. Same as possible cause 1 responses

   b. If internal recycles cause serious problems which interfere with treatment of influent wastewater, the recycles cannot be eliminated and the aeration system cannot be controlled by responses in a, then

      1. Pre-treat recycle streams before returning to aeration system;

      2. Provide means to equalize recycle loads and bleed them into aeration system;

      3. Pre-aerate recycle streams before returning to aeration system;

      4. Consider and evaluate use of chemical additives such as coagulants and coagulant aids in aeration system to maintain process integrity.

Possible Cause 7

1. Immediate or Temporary Response

   (Same as possible cause 1 reponses)

2. Long Term Corrective Actions

   a. Decrease waste activated sludge to increase solids inventory. Monitor F/M and MCRT and readjust wasting rate when parameters are in optimum range.

   b. Decrease return activated sludge flow rate to concentrate return and increase aeration basin detention time

   c. If a and b are not effective

      1. Increase aeration volume in use

      2. Use sludge reaeration mode of operation

Possible Cause 8

1. Immediate or Temporary Response

   a. Same as possible cause 1 responses

   b. Check and evaluate final clarifier operation and design for possible problems

      1. Sludge collection, return or wasting systems not operating properly

         a. Rake or collector drive mechanism broken or shut off because of torque overload

         b. Broken chains

         c. Missing flights or scrappers

         d. Plugged collectors or pumps

         e. Pumps not operating

      2. Hydraulic overload

      3. Solids overload

      4. Improperly maintained clarifier weirs

5. Unequal load distribution to multiple clarifiers

6. Improperly designed clarifier

a. High velocity currents at weirs

b. Short circuiting

2. Long Term Corrective Action

a. Same as possible cause 7 responses

b. Correct final clarifier deficiencies

1. Sludge collection, return or wasting systems not operating properly

a. Repair or reset

b. Repair or replace

c. Repair

d. Unplug collectors or pumps

e. Repair or reset pumps

2. Hydraulic overload

a. Put additional clarifiers in service, if possible

b. Reduce hydraulic load to clarifier, if possible

3. Solids overload

a. Put additional clarifiers in service

b. Reduce solids load to clarifier, if possible

c. Take actions to produce faster settling solids (possible cause 7 responses)

4. Improperly maintained clarifier weirs

(Check weirs for level and level if necessary)

5. Unequal load distribution to multiple clarifiers

   a. Check weirs to verify that all clarifiers have same weir elevation. Adjust as needed.

   b. Check inlet and effluent structures for obstructions - remove obstructions

   c. Check and adjust flow distribution system

6. Improperly designed clarifier

   a. High velocity currents at weirs
      1. Check adequacy of total weir length. Add weirs if needed

      2. Block excess weirs which may cause localized velocity currents

      3. If velocity currents caused by weir placement too close to wall, move weirs away from wall

   b. Short circuiting

      1. Check and adjust weirs

      2. Check adequacy of inlet target baffles and skirts. Correct target baffles and skirt deficiencies.

      3. If inlet velocities are excessive, provide mechanism to dampen inlet velocities

      4. Check for thermal stratification in clarifier. Eliminate cause of thermal stratification.

Possible Cause 9

1. Immediate or Temporary Response

   (None)

2. Long Term Corrective Action

   a. Continue operation using current practices if process is performing well and there are no other problems

b. Check, evaluate and correct BOD test procedure. Most likely cause is high nitrifier population in seed organisms used in BOD test

1. Change seed

2. Inhibit nitrification in BOD test using alternate procedure

NOTE: This problem frequently occurs in effluent BOD determination also

c. Nitrification in influent BOD test may be desirable, and hence, this is not a problem.

PART III

Abstracted Reference Materials

TITLE ACTIVATED SLUDGE.
AUTHOR SCHROEDER, E. D.
CORP AUTH CALIFORNIA UNIV., DAVIS.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 47 NO 6, P 1261-1269, JUNE, 1975. 101 REF.
KEYWORDS *REVIEWS, *BIBLIOGRAPHIES, *ACTIVATED SLUDGE, *WASTE WATER TREATMENT, INDUSTRIAL WASTES, PHOSPHORUS, NITROGEN, NUTRIENT REMOVAL, DESIGN, OPERATIONS, MATHEMATICAL MODELS, AERATION, WASTE TREATMENT, WATER POLLUTION CONTROL, PULP WASTES, CONTROL, HEAVY METALS, BIOCHEMISTRY, MICROBIOLOGY, TOXINS, SLUDGE TREATMENT, SLUDGE DISPOSAL, ECONOMICS, COSTS.
ABSTRACT THE 1974 LITERATURE ON THE TREATMENT OF WASTE WATERS BY THE ACTIVATED SLUDGE PROCESS IS REVIEWED. TOPICS DISCUSSED INCLUDE: PROCESS MODELS, CONTROL, AND DESIGN AND OPERATION OF ACTIVATED SLUDGE PLANTS; MICROBIOLOGY AND BIOCHEMISTRY OF THE PROCESS; REMOVAL OF HEAVY METALS AND EFFECTS OF TOXICANTS; INDUSTRIAL WASTE WATER TREATMENT; AERATION; NITROGEN AND PHOPHORUS REMOVAL; SLUDGE THICKENING AND DISPOSAL; AND COSTS OF ACTIVATED SLUDGE PLANTS. REFINERY, PULP AND PAPER, AND DISTILLERY WASTES ARE CITED AS EXAMPLES OF SOME OF THE WASTE MATERIALS THAT ARE BEING TREATED BY THE ACTIVATED SLUDGE PROCESS. (WITT-IPC)

TITLE ACTIVATED SLUDGE BASIC DESIGN CONCEPTS.
AUTHOR MCKINNEY, ROSS E.; OFERIEN, WALTER J.
CORP AUTH KANSAS UNIV., LAWRENCE.
AVAIL JOURNAL OF WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 11, PART 1, P 1831-1834, NOV 1968. 16 REF.
IDEN SCREENING, PRIMARY SEDIMENTATION, SECONDARY SEDIMENTATION.
KEYWORDS *ACTIVATED SLUDGE, *AERATION, *DESIGN, *WASTE WATER TREATMENT, HISTORY, MIXING, SETTLING BASINS, SLUDGE DISPOSAL.
ABSTRACT THE DESIGN OF ACTIVATED SLUDGE SYSTEMS HAS EVOLVED SLOWLY AND PROGRESS HAS BEEN MADE LARGELY ON AN EMPIRICAL BASIS. THIS PAPER PRESENTS THE BASIC DESIGN CONCEPTS FOR A MODERN ACTIVATED SLUDGE SYSTEM INCLUDING THE FOUNDATIONS ON WHICH THESE CONCEPTS WERE DEVELOPED. DESIGN PARAMETERS DEVELOPED FOR CONVENTIONAL AND COMPLETELY MIXED SYSTEMS INDICATE THAT AERATION WILL BE FROM 3 TO 8 HOURS. TOTAL MLSS WILL RANGE FROM 1500 TO 4000 MG/L, ORGANIC LOADS OF 0.5 TO 0.7 LB BOD/LB

MICROBIAL SOLIDS WILL YIELD GOOD OPERATIONS, AND DIFFUSED AERATION OF 1000 CUBIC OF AIR PER POUND OF BOD REMOVED IS A SOUND PARAMETER. ALL ASPECTS OF ACTIVATED SLUDGE SCHEMES ARE DISCUSSED WITH DESIGN PARAMETERS GIVEN. (HANCUFF-TEXAS)

TITLE ACTIVATED SLUDGE PROCESS WORKSHOP MANUAL
PUB DATE JUL 76
AVAIL PUBLICATIONS CENTRE, ONTARIO MINISTRY OF GOVERNMENT SERVICES, 880 BAY STREET, 5TH FLOOR, TORONTO, ONTARIO, CANADA M7A 1N8 ($2.00; ORDERS MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER PAYABLE TO "THE TREASURER OF ONTARIO")
DESC *BEHAVIORAL OBJECTIVES, *CHEMISTRY, *ENVIRONMENTAL EDUCATION, ENVIRONMENTAL TECHNICIANS, JOB SKILLS, *POLLUTION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *WORKSHOPS, ACTIVATED SLUDGE, ONTARIO
ERIC NO. ED155033
EDRS PRICE EDRS PRICE MF-$0.83 PLUS POSTAGE. HC NOT AVAILABLE FROM EDRS
DESC NOTE 242P.; FOR RELATED DOCUMENT, SEE SE 024 226-233; NOT AVAILABLE IN HARD COPY DUE TO COPYRIGHT RESTRICTIONS; CONTAINS COLOREL PAGES WHICH MAY NOT REPRODUCE WELL.
ISSUE RIEOCT78
ABSTRACT THIS MANUAL WAS DEVELOPED FOR USE AT WORKSHOPS DESIGNED TO UPGRADE THE KNOWLEDGE OF EXPERIENCED WASTEWATER TREATMENT PLANT OPERATORS. EACH OF THE LESSONS IN THIS DOCUMENT HAS CLEARLY STATED BEHAVIORAL OBJECTIVES TO TELL THE TRAINEE WHAT HE SHOULD KNOW OR DO AFTER COMPLETING THAT TOPIC. AREAS COVERED IN THIS MANUAL INCLUDE: TYPES AND FACTORS AFFECTING ACTIVATED SLUDGE PROCESSES, IDENTIFICATION AND SOLUTION OF OPERATING PROBLEMS, SELECTED TESTS AND MEASUREMENT, AND CHEMICAL DETERMINATIONS. A GLOSSARY OF TERMS IS INCLUDED FOR REFERENCE. (CS)

TITLE ACTIVATED SLUDGE. TRAINING MODULE 2.117.4.77.
PUB DATE SEP 77
DESC *INSTRUCTIONAL MATERIALS, *POST SECONDARY EDUCATION, SECONDARY EDUCATION, *TEACHING GUIDES, *UNITS OF STUDY, *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, OPERATIONS (WASTEWATER), *WASTEWATER TREATMENT
ERIC NO. ED151222
EDRS PRICE EDRS PRICE MF-$0.83 HC-$6.01 PLUS POSTAGE

DESC NOTE 11P.: FOR RELATED DOCUMENTS, SEE SE 024-025-447; CONTAINS SMALL TYPE IN FIGURES

ISSUE RIEJUL78

ABSTRACT THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH OPERATION OF ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS, AND TRANSPARENCY MASTERS. THIS IS THE THIRD LEVEL OF A THREE MODULE SERIES AND CONSIDERS DESIGN AND OPERATION PARAMETERS, PROCESS CONTROL PROCEDURES, INTERPRETATION OF TREND CHART DATA AND THE OXYGEN UPTAKE TEST. (AUTHOR/RH)

TITLE ACTIVATED SLUDGE-UNIFIED SYSTEM DESIGN AND OPERATION

AUTHOR KEINATH, T. M.; RYCKMAN, M. D.; DANA, C. H.; HOFER, D. A.

CORP AUTH CLEMSON UNIV., SC. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING.

PUB DESC JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, PROCEEDINGS OF ASCE, VOL 013, NO EE5, P 829-849, OCTOBER, 1977. 11 FIG, 2 TAB, 19 REF, 1 APPEND

DESC *ACTIVATED SLUDGE, *ANALYTICAL TECHNIQUES, *SEDIMENTATION RATES, *TREATMENT FACILITIES, *DESIGN, BIOLOGICAL TREATMENT, OPERATION AND MAINTENANCE, EVALUATION, AERATION, WASTE WATER TREATMENT

ABSTRACT THE SETTLING FLUX APPROACH CAN BE ADAPTED FOR EVALUATING ECONOMIC TRADEOFFS BETWEEN ALTERNATIVE DESIGNS FOR WASTE WATER TREATMENT SYSTEMS. THE DESIGN BASIS FOR THE AERATOR INCORPORATES SOLIDS RESIDENCE TIME AND HYDRAULIC RESIDENCE TIME. THE DESIGN BASIS FOR THE CLARIFIER INCORPORATES THE CLARIFICATION CONSTRAINT, AND A RECYCLE RATE CONSTRAINT. THIS METHODOLOGY CAN BE USED FOR EVALUATING THE ECONOMIC ASPECTS OF AN ACTIVATED SLUDGE SYSTEM CONSISTING OF AN AERATION BASIN, CLARIFIER, AND SLUDGE PROCESSING EQUIPMENT. THE SETTLING - FLUX APPROACH CAN ALSO BE USED IN OPERATIONS MONITORING OF AN ACTIVTED SLUDGE SYSTEM. THIS APPROACH INDICATES THAT INCREASED HYDRAULIC FLOW RATES WOULD ONLY CAUSE SOLIDS TO ENTER THE EFFLUENT AT CERTAIN CRITICALLY LOCATED POINTS NEAR THE SETTLING FLUX CURVE. FOR DECREASED HYDRAULIC FLOW RATES, THE RECYCLE RATE COULD BE REDUCED TO THE POINT OF CRITICAL LOADING. THE SETTLING FLUX APPROACH INDICATES THAT THE FLOW PROPORTIONAL RECYCLE CONTROLS CAN ESTIMATE THE

REQUIRED FLOW FAIRLY ACCURATELY. IT DOES NOT, HOWEVER, PROVIDE THE PRECISE RECYCLE RATE REQUIRED TO MAINTAIN THE CLARIFIER IN A CRITICALLY LOADED CONDITION. THIS APPROACH CAN ALSO ESTABLISH THE HYDRAULIC SURGE THAT A SYSTEM COULD ACCOMMODATE WITHOUT INDISCRIMINATE SOLIDS WASTING. THIS APPROACH CAN ONLY BE USED FOR OPERATIONS MONITORING AND CONTROL IF CURRENT SETTLING FLUX CURVES ARE AVAILABLE. CHANGES IN THE OPERATIONAL SET-POINT OF SOLIDS RESIDENCE TIME CAN BE ACCOMMODATED BY CHANGES IN THE SOLIDS WASTING PROGRAM. (SNYDER-FIRL)

TITLE AERATION: PROPER SIZING IS CRITICAL.
AUTHOR SHERRARD, J. H.
CORP AUTH VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF CIVIL ENGINEERING.
AVAIL WATER AND WASTES ENGINEERING, VOL 14, NO 4, P 62, 66-67, 71, APRIL, 1977. 4 FIG, 4 TAB, 6 REF.
IDEN MECHANICAL AERATORS
KEYWORDS *AERATION, *TREATMENT FACILITIES, *DESIGN, PERFORMANCE, ACTIVATED SLUDGE, MECHANICAL EQUIPMENT, OXYGEN, TEMPERATURE, MICROORGANISMS, OPERATIONS, BIOCHEMICAL OXYGEN DEMAND, NITROGEN, NITRIFICATION, *WASTE WATER TREATMENT
ABSTRACT THE SELECTION OF LOW SPEED MECHANICAL AERATORS WAS CONSIDERED. ANY AERATION METHOD MUST PRODUCE ENOUGH MIXING TO MAINTAIN ACTIVATED SLUDGE FLOC IN SUSPENSION AND SUPPLY SUFFICIENT OXYGEN TRANSER TO MEET THE DEMANDS OF MICROBIAL GROWTH. EQUATIONS WERE PROVIDED TO HELP JUDGE A GIVEN AERATOR'S PERFORMANCE. MECHANICAL AERATORS MUST MEET TWO STANDARDS: POWER, AND SUFFICIENT OXYGEN FOR MICROBIAL METABOLISM. THE FIRST DEPEND UPON THE TYPE OF AERATOR AND THE GEOMETRY OF THE BASIN. THE LATTER INVOLVES OXYGEN FOR ORGANIC REMOVAL AND NITRIFICATION, AND DEPENDS ON PLANT OPERATION AND THE BOD5/ORG-N + NH(+4) - N RATIO. BIOKINETIC COEFFICIENTS SHOULD BE ESTABLISHED TO MAKE QUALITY AND OXYGEN NEEDS PREDICTABLE AS A FUNCTION OF TREATMENT PROCESS OPERATING CONDITIONS. SEVERAL EXAMPLES OF TYPICAL SOLUTIONS WERE PRESENTED. IT WAS CONCLUDED THAT THE USE OF A RATIO OF 1 MG/LITER OF OXYGEN TO 1 MG/LITER OF BOD5 COULD BE MISLEADING AND RESULT IN A FAULTY SELECTION. NITROGENOUS OXYGEN DEMAND FROM NITRIFICATION SHOULD BE USED FOR AERATOR SELECTION IF HIGHER MEAN CELL RESIDENCE TIME VALUES ARE USED. OXYGEN TRANSFER REQUIREMENTS CAN BE MET IN SOME INSTANCES

BY LOWERING PROCESS MEAN CELL RESIDENCE TIME TO DECREASE OXYGEN NEEDS. (COLLINS-FIRL)

TITLE AN AUTOMATED SPECTROPHOTOMETRIC SUSPENDED SOLIDS ANALYSIS FOR ACTIVATED SLUDGE.

AUTHOR FINGER, R. E.; STRUTYNSKI, B. J.

CORP AUTH MUNICIPALITY OF METROPOLITAN SEATTLE, RENTON, WASH. RENTON TREATMENT PLANT

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 47, NO 5, P 1043-1054, MAY, 1975. 11 FIG, 4 TAB, 15 REF.

IDEN *SLUDGE VOLUME INDEX

KEYWORDS *ACTIVATED SLUDGE, *BIOLOGICAL TREATMENT, *SUSPENDED SOLIDS, *WASTE WATER TREATMENT, COLORIMETRY, AUTOMATION, SAMPLING, MEASUREMENT, ANALYTICAL TECHNIQUES, *POLLUTANT IDENTIFICATION, *SPECTROPHOTOMETRY

ABSTRACT THE MEASUREMENT OF SUSPENDED SOLIDS (SS) CONCENTRATION IN BIOLOGICAL WASTE TREATMENT IS USED AS A PRIMARY CONTROL, FOR PROCESS ADJUSTMENT. THE SS MEASUREMENT IS NECESSARY FOR CALCULATION OF CELL RESIDENCE TIME, ORGANIC LOADING, AND SLUDGE VOLUME INDEXES, THE DETERMINATION OF TYPES OF POLYSACCHARIDES ASSOCIATED WITH ACTIVATED SLUDGE AND THEIR EFFECTS ON THE PHYSICAL CHARACTERISTICS OF SLUDGE HAVE BEEN INVESTIGATED BY A SIMPLE COLORIMETRIC TEST. THE PURPOSE OF THIS STUDY WAS TO CONSIDER THE POSSIBILITY OF ADAPTING THIS TEST TO AN AUTOMATED PROCEDURE. A MANUAL COLORIMETRIC PROCEDURES WHICH TAKES TWO OR THREE HOURS WAS FIRST TESTED AND IT PROVED TO EFFECTIVELY MEASURE MIXED LIQUOR SUSPENDED SOLIDS AND VSS. THE AUTOMATED SPECTROPHOTOMETRIC SS TEST TAKES ONLY FIFTEEN MINUTES AND WAS DEMONSTRATED TO BE PRACTICAL FOR USE ON A CONTINUOUS BASIS. THE MAJOR PROBLEM WITH THE TECHNIQUE IS SAMPLING, WHICH MAY BE IMPROVED BY THE INSTALLATION OF A HOMOGENIZATION SYSTEM. (PRAGUE-FIRL)

TITLE BASIC ACTIVATED SLUDGE. TRAINING MODULE 2.115.2.77.

PUB DATE SEP 77

DESC *INSTRUCTIONAL MATERIALS, *POST SECONDARY EDUCATION, SECONDARY EDUCATION, *TEACHING GUIDES, *UNITS OF STUDY, *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, OPERATIONS (WASTEWATER); *WASTEWATER TREATMENT

ERIC NO. ED151220

130

EDRS PRICE EDRS PRICE MF-$0.83 HC $4.67 PLUS POSTAGE
DESC NOTE 93P.; FOR RELATED DOCUMENTS, SEE SE 024 025-047; CONTAINS OCCASIONAL LIGHT AN DBROKEN TYPE.
ISSUE RIEJUL78
ABSTRACT THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH OPERATION OF ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS, AND TRANSPARENCY MASTERS. THIS IS THE FIRST OF A THREE MODULE SERIES AND CONSIDERS, DEFINITION OF TERMS, DESIGN AND OPERATION PARAMETERS, PROCESS OBSERVATIONS, BASIC PROCESS CONTROLS AND CONTROL TESTS. (AUTHOR/RH)
INSTITUTION NAME KIRKWOOD COMMUNITY COLL., CEDAR RAPIDS, IOWA.

TITLE BASIC LABORATORY SKILLS. TRAINING MODULE 5.300.2.77.
PUB DATE SEP 77
DESC *BIOLOGY, *CHEMISTRY, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, *LABORATORY TECHNIQUES, POST SECONDARY EDUCATION, SECONDARY EDUCATION, UNITS OF STUDY, WATER POLLUTION CONTROL, WATER RESOURCES, *WASTEWATER TREATMENT, *WATER TREATMENT
ERIC NO. ED153866
EDRS PRICE EDRS PRICE MF-$0.83 HC-$10.03 PLUS POSTAGE
DESC NOTE 195P.; FOR RELATED DOCUMENTS, SEE SE 024 249-254
ISSUE RIESEP78
ABSTRACT THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH THE BASIC CHEMICAL AND MICROBIOLOGICAL LABORARORY EQUIPMENT AND PROCEDURES USED IN WATER AND WASTEWATER TREATMENT PLANT LABORATORIES. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS AND TRANSPARENCY MASTERS. THIS MODULE CONSIDERS LAB SAFETY, BENCH SHEETS, LABELING, SAMPLING, SOLUTIONS, DILUTION TECHNIQUES, INCUBATORS, BALANCES, GLASSWARE, STANDARDIZATION, STANDARD CURVES, EQUIPMENT PACKAGING, AUTOCLAVES, MICROSCOPES AND ASEPTIC TECHNIQUES. (AUTHOR/RH)
INSTITUTION NAME KIRKWOOD COMMUNITY COLL., CEDAR RAPIDS, IOWA.

TITLE	BASIC SEWAGE TREATMENT OPERATION.
PUB DATE	NOV 76
AVAIL	PUBLICATIONS CENTRE, ONTARIO MINISTRY OF GOVERNMENT SERVICES, 880 BAY STREET, 5TH FLOOR, TORONTO, ONTARIO, CANADA M7A 1N8 ($2.00; ORDERS MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER PAYABLE TO "THE TREASURER OF ONTARIO")
DESC	*BEHAVIORAL OBJECTIVES, *ENVIRONMENTAL EDUCATION, ENVIRONMENTAL TECHNICIANS, JOB SKILLS, *POLLUTION, SAFETY, SAMPLING, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *WORKSHOPS, ONTARIO
ERIC NO.	ED155001
EDRS PRICE	EDRS PRICE MF-$0.83 PLUS POSTAGE. HC NOT AVAILABLE FROM EDRS.
DESC NOTE	247P.; FOR RELATED DOCUMENTS, SEE SE 024 227-233; NOT AVAILABLE IN HARD COPY DUE TO COPYRIGHT RESTRICTIONS; CONTAINS COLORED PAGES WHICH MAY NOT REPRODUCE WELL.
ISSUE	RIEOCT78
ABSTRACT	THIS MANUAL WAS DEVELOPED FOR USE AT WORKSHOPS DESIGNED TO INTRODUCE OPERATORS TO THE FUNDAMENTALS OF SEWAGE PLANT OPERATION. THE COURSE CONSISTS OF LECTURE-DISCUSSIONS AND HANDS-ON ACTIVITIES. EACH OF THE LESSONS HAS CLEARLY STATED BEHAVIORAL OBJECTIVES TO TELL THE TRAINEE WHAT HE SHOULD KNOW OR DO AFTER COMPLETING THAT TOPIC. AREAS COVERED IN THIS MANUAL INCLUDE: INTRODUCTION TO SEWAGE TREATMENT, BACTERIOLOGY, PRIMARY TREATMENT, ACTIVATED SLUDGE PROCESS, SAMPLING, AND RECORD KEEPING, SAFETY, AND SELECTED TESTS. A GLOSSARY OF TERMS IN INCLUDED FOR REFERENCE. (CS)

TITLE	BIOLOGICAL AND CHEMICAL WASTE TREATMENT EXPERIMENTS IN FAR NORTHERN SWEDEN
AUTHOR	BALMER, P.
AVAIL	IN: INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES, JULY 22-24, 1970, UNIVERSITY OF ALASKA, COLLEGE, P 252-262, 6 FIG, 6 TAB, 5 REF.
IDEN	*KIRUNA (SWEDEN), *CHEMICAL TREATMENT

KEYWORDS *BIOLOGICAL TREATMENT, *WASTE WATER TREATMENT, *ACTIVATED SLUDGE, TEMPERATURE, BACTERIA, *AERATION, FLOCCULATION, COSTS, COLD REGIONS, CHEMICAL PRECIPITATION, PHOSPHORUS, SUSPENDED SOLIDS, SLUDGE, PILOT PLANTS, SEWAGE, RECIRCULATED WATER, SETTLING BASINS, HYDROGEN ION CONCENTRATION, EFFLUENTS

ABSTRACT LABORATORY DATA SHOW THAT THE METABOLIZING ACTIVITY OF ACTIVATED SLUDGE IS SERIOUSLY HAMPERED AT LOW TEMPERATURES, AND BOD REDUCTION DATA IN ACTIVATED SLUDGE SYSTEMS AT LOW TEMPERATURES ARE PARTLY CONTRADICTORY. PILOT PLANT EXPERIMENTS WERE CONDUCTED WITH ACTIVATED SLUDGE AND CHEMICAL TREATMENT. THE ACTIVATED SLUDGE TREATMENT PROVED THAT BIOLOGICAL TREATMENT IS POSSIBLE EVEN AT VERY LOW SEWAGE TEMPERATURES. AS THE METABOLIZING ACTIVITY OF THE ACTIVATED SLUDGE BACTERIA IS CONSIDERABLY REDUCED, LONG AERATION PERIODS, 4-5 HOURS, AND LARGE AERATION BASINS, ARE REQUIRED. CHEMICAL TREATMENT IS MUCH LESS SENSITIVE TO LOW TEMPERATURES AND REQUIRES ONLY ABOUT 0.5 HOUR DETENTION TIME IN FLOCCULATION TANKS. DIFFERENCE IN INVESTMENT COSTS WILL IN MANY INSTANCES BE SO LARGE THAT THE INCREASED RUNNING COSTS ARE JUSTIFIED. IF A COMMUNITY HAS AN EXISTING PRIMARY TREATMENT PLANT WITH A LONG DETENTION TIME (MORE THAN 2 HOURS), IT MAY BE POSSIBLE TO ACHIEVE A SUBSTANTIAL INCREASE IN TREATMENT EFFICIENCY SIMPLY ADDING FLOCCULATING CHEMICALS TO THE INFLUENT. BOD REMOVAL WITH CHEMICAL TREATMENT IS SOMEWHAT INFERIOR TO WHAT CAN BE ACHIEVED WITH BIOLOGICAL TREATMENT. THIS DRAWBACK, HOWEVER, IS COMPENSATED BY SUPERIOR PHOSPHORUS REMOVAL. (SEE ALSO W72-12548) (JONES-WISCONSIN)

TITLE BIOMASS DETERMINATION - A NEW TECHNIQUE FOR ACTIVATED SLUDGE CONTROL.

CORP AUTH BIOSPHERICS INC., ROCKVILLE, MD.

AVAIL COPY AVAILABLE FROM GPO SUP DOC EPA 17050 EOY 01/72, $1.25; MICROFICHE FROM NTIS AS PB-211 127, $0.95. ENVIRONMENTAL PROTECTION AGENCY, WATER POLLUTION CONTROL RESEARCH SERIES, NO 17050 EOY. JANUARY 1972, 116 P, 53 FIG, 22 TAB, 18 REF, EPA PROGRAM 17050 EOY 01/72.

IDEN KEYWORDS *ATP, *PROCESS CONTROL, *ADENOSINE TRIPHOSPHATE

*ACTIVATED SLUDGE, *ANALYTICAL TECHNIQUES, *WATER QUALITY, *CONTROL, MONITORING, SUSPENDED SOLIDS, *BIOMASS, SEPARATION TECHNIQUES, LABORATORY TESTS, PILOT PLANTS, ON-SITE INVESTIGATIONS, *WASTE WATER TREATMENT

ABSTRACT RESEARCH WAS CONDUCTED TO DETERMINE THE FEASIBILITY OF USING ADENOSINE TRIPHOSPHATE (ATP) AS A MEASURE OF VIABLE BIOMASS IN ACTIVATED SLUDGE. METHODS WERE DEVELOPED FOR THE EXTRACTION OF ATP FROM SLUDGE AND MIXED LIQUOR, AND FOR THE DETERMINATION OF ATP USING THE FIREFLY BIOLUMINESCENT PROCEDURE. MEASUREMENTS OF ATP WERE CONDUCTED ON VARIOUS PURE CULTURES, PILOT PLANT AND FULL-SCALE ACTIVATED SLUDGE TREATMENT PLANTS. ADDITIONAL PARAMETERS INCLUDING BOD, TOC, OXYGEN UPTAKE RATE, AND SUSPENDED SOLIDS WERE MEASUREED TO PROVIDE COMPARATIVE AND SUPPORTIVE INFORMATION. PRELIMINARY TESTS IN WHICH ATP MEASUREMENTS OF BIOMASS WERE USED TO CONTROL THE PERCENT SLUDGE RETURN WERE CONDUCTED AT TWO FULL-SCALE MUNICIPAL SEWAGE TREATMENT PLANTS. LOWERED RETURN SLUDGE RATES WERE FOUND TO PRODUCE EFFECTIVE TREATMENT AND INCREASE THE BIOLOGICAL ACTIVITY OF THE SLUDGE. CHANGES IN THE RATE OF RETURN SLUDGE RESULTED IN CHANGES IN ATP CONCENTRATION OF MIXED LIQUOR WHICH PRECEDED CHANGES IN SUSPENDED SOLIDS BY AS MUCH AS 24 HOURS. THE ASSAY WAS FOUND TO BE REPRODUCIBLE AND RAPID, RESULTS CAN BE OBTAINED WITHIN APPROXIMATELY TEN MINUTES. (LOWRY-TEXAS)

TITLE COMPARATIVE EVALUATION OF SEQUENCING BATCH REACTORS

AUTHOR IRVINE, R. L.; RICHTER, R. O.

CORP AUTH NOTRE DAME UNIV., IN. DEPT OF CIVIL ENGINEERING

PUB DESC JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, VOL 104, NO EE3, PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, P 503-514, JUNE 1978. 3 FIG, 4 TAB, 15 REF.

KEYWORDS *ACTIVATED SLUDGE, *BATCH REACTORS, *SEQUENCING, *SEWAGE TREATMENT, *COMPUTER MODELS, *SIMULATION ANALYSIS, WASTE WATER (POLLUTION), MASS BALANCE EQUATIONS, FLOW, DESIGN, PERIODIC VARIATIONS, OPERATIONS RESEARCH

134

ABSTRACT THE PERFORMANCE OF MANY PROCESSES AND OPERATIONS CAN BE IMPROVED APPRECIABLY BY THE CONTROLLED UNSTEADY OPERATIONS THAT ARE PROVIDED BY SEQUENCING BATCH (FILL AND DRAW) BIOLOGICAL REACTORS. THE LACK OF DESIGN AND OPERATION EXPERIENCE IN BATCH TREATMENT HAS RESULTED IN AN EXPERIENCE VOID THAT HAS FOSTERED THE SELECTION OF CONTINUOUS FLOW RATHER THAN BATCH TREATMENT SCHEMES. SYSTEM SELECTION SHOULD DEPEND INSTEAD UPON SUITABILITY OF THE SYSTEM, RELIABILITY, EFFICIENCY, CONSISTENCY, AND ECONOMIC. BENCH, PILOT, AND FULL-SCALE INVESTIGATIONS, AND DESK TOP AND COMPUTER ANALYSES MUST SUPPLEMENT EXISTING BENCH SCALE STUDIES IF THE EXPERIENCE VOID IS TO BE FILLED. SEVERAL HYPOTHETICAL EXAMPLES ARE USED TO PARTIALLY FILL THE VOID BY COMPARING VOLUMES FOR BOTH THE BATCH AND CONTINUOUS FLOW SYSTEMS. IN THE EXAMPLES, SEQUENCING BATCH TREATMENT PROVIDES THE POTENTIAL FOR ACHIEVING EFFLUENT LIMITATIONS IN A TOTAL VOLUME NOTABLY LESS THAN THAT FOR A CONVENTIONAL CONTINUOUS FLOW SYSTEM. THIS ADDS TO PREVIOUSLY RECOGNIZED ADVANTAGES THAT INCLUDE HOLDING A WASTE UNTIL A PROPER TREATMENT IS ACHIEVED. THE COMPUTER SIMULATIONS HEREIN HAVE SHOWN HOW THE DESIGN VOLUME FOR A SEQUENCING BATCH SYSTEM DIFFERED AS A FUNCTION OF THE RELATIVE VARIABILITY OF THE MASS FLOW RATE EVEN THOUGH THE AVERAGE MASS FLOW RATE WAS THE SAME FOR ALL CASES INVESTIGATED. (GRAF-CORNELL)

TITLE CONTACT STABILIZATION IN SMALL PACKAGE PLANTS
AUTHOR DAGUE, R. R.; ELBERT, G. F.; ROCKWELL, M. D.
CORP AUTH IOWA UNIV., IOWA CITY.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 44, NO 2, FEBRUARY 1972, P 255-264, 11 FIG, 3 TAB, 6 REF.
IDEN *CONTACT STABILIZATION, *PACKAGE PLANTS
KEYWORDS *ACTIVATED SLUDGE, *DESIGN CRITERIA, *ON-SITE INVESTIGATIONS, AERATION, RESPIRATION, ABSORPTION, ADSORPTION, MIXING, BIODEGRADATION, ORGANIC LOADING, BIOCHEMICAL OXYGEN DEMAND, SUSPENDED SOLIDS, WASTE WATER TREATMENT
ABSTRACT INVESTIGATION WITH CONTACT STABILIZATION PACKAGE TREATMENT PLANTS AS CURRENTLY DESIGNED HAS DEMONSTRATED THAT SUCH FACILITIES ARE UNSTABLE UNDER CONDITIONS OTHER THAN 24 HOUR OPERATION. TWO CONTACT STABILIZATION PLANTS CURRENTLY HAVING OPERATIONAL DIFFICULTIES WERE MODIFIED, ONE TO THE CONVENTIONAL ACTIVATED SLUDGE PROCESS AND THE

OTHER TO COMPLETE MIX OPERATION. THE DIFFICULTIES ENCOUNTERED BY THE CONTACT STABILIZATION STEMMED MAINLY FROM FLOW VARIATIONS, AND THE FACT THAT MOST PLANTS ARE DESIGNED FOR A 3-HOUR CONTACT TIME RATHER THAN THE 15 TO 30 MIN. CONTACT TIME ORIGINALLY DEVELOPED. THE WIDE VARIABILITY OF THE MUNICIPAL WASTE FLOW FOR THE FIRST SYSTEM EVALUATED CAUSED THE WASTES IN THE CONTACT ZONE TO HAVE A RETENTION TIME VARYING FROM 2 TO 8 HOURS. EACH OF THE OTHER PLANT OPERATIONS WAS SIMILARLY AFFECTED. THE TROUBLE WHICH AROSE THEN, WAS MAINLY IN SEPARATING THE SOLIDS FROM THE EFFLUENT, WHICH BECAME NEARLY IMPOSSIBLE. AFTER MODIFICATION, THE TWO PLANTS FUNCTIONED EXTREMELY WELL, PRODUCING EFFLUENTS OF 13 MG/L OR LESS OF BOD AND 12 MG/L OR LESS OF SUSPENDED SOLIDS. (LOWRY-TEXAS)

TITLE THE DESIGN, CONSTRUCTION, AND OPERATION OF EXTENDED-AERATION PLANTS.
AUTHOR STORCH, B.
CORP AUTH PETERS, G. D. (ENGINEERING) LTD.
AVAIL WATER POLLUTION CONTROL, VOL 68, NO 1, P 40-50, JAN-FEB 1969, 4 REF.
IDEN *EXTENDED AERATION, AEROBIC DIGESTION
KEYWORDS *ACTIVATED SLUDGE, *OPERATION AND MAINTENANCE, *DESIGN, *CONSTRUCTION, AERATION, WASTE WATER TREATMENT, AEROBIC CONDITIONS
ABSTRACT THE DESIGN OF AN EXTENDED AERATION PLANT IS DISCUSSED INCLUDING: INLET, AERATION TANK, AERATION TO SETTLING TRANSFER, INLET TO SETTLING TANKS, SETTLING TANK, SLUDGE RETURN, SURFACE SKIMMING, EFFLUENT WITHDRAWAL, AND EXCESS SLUDGE HANDLING. EXCESS SLUDGE HANDLING IS TREATED AT LENGTH INCLUDING AEROBIC DIGESTION. PHYSICAL DESCRIPTIONS AND RECOMMENDED DIMENSIONS FOR VARIOUS COMPONENTS AND EQUATIONS FOR SEVERAL CALCULATIONS ARE GIVEN. RECOMMENDATIONS ARE MADE FOR MATERIALS TO BE USED, POSITIONING OF EQUIPMENT AND OTHER FACETS OF CONSTRUCTION. PLANT START-UP IS DESCRIBED AND A CHECKLIST FOR OPERATION AND MAINTENANCE IS GIVEN. (DIFILIPPO-TEXAS)

TITLE DESIGN PROCEDURES FOR DISSOLVED OXYGEN CONTROL OF ACTIVATED SLUDGE PROCESSES
AUTHOR FLANAGAN, M. J.; BRACKEN, B. D.
CORP AUTH BROWN AND CALDWELL, WALNUT CREEK, CA
PUB DESC AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-270 960, IN

PAPER COPY, IN MICROFICHE, REPORT NO. EPA-600/2-77-032, JUNE, 1977. 217 P, 86 FIG, 31 TAB, 47 REF, 1 APPEND. 68-2130.

KEYWORDS *DISSOLVED OXYGEN, *ACTIVATED SLUDGE, *SLUDGE TREATMENT, *AERATION, *AUTOMATION, *COST ANALYSIS, ECONOMICS, COSTS, OPERATING COSTS, CAPITAL COSTS, MAINTENANCE COSTS, MANUAL CONTROL, AUTOMATIC CONTROL, CONTROL SYSTEMS, EQUIPMENT, PERFORMANCE, OPERATIONS, DESIGN, MAINTENANCE, APPLICATION METHODS, WASTE WATER TREATMENT, WASTE TREATMENT, SEWAGE TREATMENT, WATER PURIFICATION, INSTRUMENTATION, *AERATION EQUIPMENT, *ACTIVATED SLUDGE TREATMENT PLANTS, *COST EFFECTIVENESS, ECONOMIC ANALYSIS, MANUAL DISSOLVED OXYGEN CONTROL, AUTOMATIC DISSOLVED OXYGEN CONTROL, CONTROL EQUIPMENT.

ABSTRACT DESIGN PROCEDURES AND GUIDELINES FOR THE SELECTION OF AERATION EQUIPMENT AND DISSOLVED OXYGEN (DO) CONTROL SYSTEMS FOR ACTIVATED SLUDGE TREATMENT PLANTS ARE PRESENTED. PROCESS CONFIGURATIONS AND DESIGN PARAMETERS ARE REVIEWED TO ESTABLISH SYSTEM REQUIREMENTS. AERATION METHODS, EQUIPMENT AND APPLICATION TECHNIQUES, DESIGN SYSTEMS, AND CONTROL SYSTEM SELECTION PROCEDURES ARE EXAMINED. RECOMMENDATIONS FOR SYSTEM APPLICATIONS TO VARIOUS AERATION EQUIPMENT TYPES AND PROCESS CONFIGURATIONS ARE DESCRIBED. PERFORMANCE, OPERATIONAL AND MAINTENANCE DATA FOR AERATION EQUIPMENT AND DO CONTROL SYSTEMS FOR 12 ACTIVATED SLUDGE PLANTS ARE PRESENTED IN THE APPENDIX. AUTOMATIC DO CONTROL SYSTEMS FOR VARIOUS SIZE HYPOTHETICAL ACTIVATED SLUDGE SYSTEM CONFIGURATIONS ARE PRESENTED TO DEVELOP AN ECONOMIC ANALYSIS MANUAL AND AUTOMATIC DO CONTROL. CONCLUSIONS INDICATE THAT CAPITAL AND OPERATING COSTS OF AUTOMATIC DO CONTROL SYSTEMS ARE JUSTIFIED FOR ACTIVATED SLUDGE PLANTS LARGER THAN 1 MGD (44 DM3/S) ONLY IF EQUIPMENT IS SELECTED AND APPLIED IN ACCORDANCE WITH GUIDELINES OF THE DESIGN MANUAL AND A POWER COST IS APPLICABLE WHICH IS EQUAL TO OR GREATER THAN THE NATIONAL AVERAGE POWER RATE. AREAS IN WHICH FURTHER RESEARCH IS INDICATED ARE DISCUSSED. (SEIP-IPA)

TITLE DISSOLVED OXYGEN ANALYSIS - ACTIVATED SLUDGE CONTROL TESTING (XT-43).

AUTHOR LUDZACK, F. J.

PUB DATE JUN 71

DESC *AUDIOVISUAL AIDS, *CHEMICAL ANALYSIS, *CHEMISTRY, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, POLLUTION, *POST SECONDARY EDUCATION, SCIENCE EDUCATION, WATER POLLUTION CONTROL, *OXYGEN, WASTEWATER TREATMENT, DISSOLVED OXYGEN, *ACTIVATED SLUDGE

DESC NOTE INCLUDED IS A 34 MINUTE TAPE, 72 SLIDES, AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W ST. CLAIR, CINCINNATI, OHIO 45268

ABSTRACT THIS MODULE IS DESIGNED FOR ADVANCED WASTEWATER TREATMENT PLANT OPERATORS OR PLANT CONTROL SUPERVISORS. RAPID AND VALID TECHNIQUES ARE DESCRIBED FOR CONTROL OF THE ACTIVATED SLUDGE TREATMENT PROCESS USING ELECTRONIC MEASUREMENT OF DO AND DO CHANGES. SAMPLE DATA ARE DISCUSSED FOR INTERPRETATION OF SLUDGE CONDITION IN RESPONSE TO STABILIZATION, FEED, LOAD RATIO OR CONDITIONS. INFORMATION OBTAINABLE WITHIN 20 MINUTES PROVIDES SUGGESTED CORRECTIVE ACTION IN TIME TO UPGRADE EFFLUENT QUALITY. (AUTHOR/JK)

TITLE DYNAMIC MODELING AND CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE PROCESS.

AUTHOR BUSBY, J. B.; ANDREWS, J. F.

CORP AUTH CLEMSON UNIV., S.C. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING; AND ENVIRONMENTAL DYNAMICS, INC.,GR.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 47, NO 5, P 1055-1080, MAY 1975. 22 FIG, 3 TAB, 23 EQU, 45 REF.

IDEN *PROCESS CONTROL, DYNAMIC MODELS, FEEDING, STEP-FEED PROCESS, RATIO CONTROL.

KEYWORDS *ACTIVATED SLUDGE, *WASTE WATER TREATMENT, *WATER QUALITY, *SIMULATION ANALYSIS, BIOLOGICAL TREATMENT, WASTES, COMPUTERS, SUSPENDED SOLIDS, SYSTEMS ANALYSIS, MATHEMATICAL MODELS, RECYCLING.

ABSTRACT CONVENTIONAL ACTIVATED SLUDGE PROCESSES MAY BE CONTROLLED BY SLUDGE RECYCLE RATE, WASTE SLUDGE FLOW RATE, AND AERATION RATE. IN A MULTISTAGE REACTOR SYSTEM SUCH AS THE STEP-FEED PROCESS, VARIATIONS IN WASTEWATER FEED PATTERNS ARE ANOTHER CONTROL TECHNIQUE. A WIDE-SPECTRUM ACTIVATED SLUDGE PROCESS MODEL WAS DEVELOPED THAT CONSIDERS THE STORAGE CAPABILITY OF THE SLUDGE, INCORPORATES THE ACTIVE AND INERT FRACTIONS OF THE MIXED LIQUOR VOLATILE SUSPENDED SOLIDS IN SEPARATE MASS BALANCES, AND IS COUPLED WITH A DYNAMIC MODEL OF THE FINAL CLARIFIER. CONTROL STRATEGIES INVESTIGATED INCLUDE VARIOUS SLUDGE WASTING AND RECYCLE CONTROL TECHNIQUES AND HYDRAULIC METHODS.

COMPUTER SIMULATION RESULTS INDICATE THAT THE MODEL SATISFACTORILY DESCRIBES THE DIFFERENT PROCESS VERSIONS AND THAT DYNAMIC VARIATIONS IN WASTEWATER FEED PATTERN ARE VALUABLE FOR CONTROL. (BELL-CORNELL)

TITLE EFFECTS OF FLOW EQUALIZATION ON THE OPERATION AND PERFORMANCE OF AN ACTIVATED SLUDGE PLANT.
AUTHOR FOESS, G. W.; AND OTHERS
PUB DATE AUG 77
AVAIL NTIS, 5285 PORT ROYAL RD., SPRINGFIELD, VA 22161 ($6.50)
DESC *ACTIVATED SLUDGE, CHEMICAL OXYGEN DEMAND, *FLOW MEASUREMENT, RESEARCH REPORTS, SEWAGE, *SLUDGE, *WASTEWATER TREATMENT, *COST EFFECTIVENESS, *OPERATIONS (WASTEWATER)
DESC NOTE 110P ORDER NO. PB 272 657
ABSTRACT A PLANT-SCALE RESEARCH PROGRAM WAS CARRIED OUT OVER A YEAR TO EVALUATE THE IMPACT OF FLOW EQUALIZATION OF THE 14,000 CU.M/DAY (3.7 MGD) UPGRADED ACTIVATED SLUDGE PLANT AT YPSILANTI TOWNSHIP, MICHIGAN. PROCESS STEAMS WERE CHARACTERIZED UNDER BOTH EQUALIZED AND UNEQUALIZED FLOW CONDITIONS WITH RESPECT TO BOD, COD, TSS AND FORMS OF NITROGEN AND PHOSPHORUS. THE EQUALIZATION SYSTEM WAS EFFECTIVE IN ITS ABILITY TO DAMPEN VARIATIONS IN WASTEWATER CONCENTRATION AND MASS FLUX. SOME BIOCHEMICAL ACTION APPARENTLY OCCURRED IN THE EQUALIZATION BASIN, ALTHOUGH BOD REMOVAL WAS MARGINAL AND INCONSISTENT. ANALYSIS OF SECONDARY EFFLUENT INDICATED THAT PLANT PERFORMANCE WAS SIMILAR WITH AND WITHOUT EQUALIZED FLOW, SUGGESTING THAT THE THEORETICAL ADVANTAGES OF FLOW EQUALIZATION MAY NOT BE ACHIEVED IN MANUALLY CONTROLLED PLANTS. AN EXAMINATION OF THEORETICAL POWER COSTS FOR EQUALIZED AND UNEQUALIZED FLOW CONDITIONS INDICATED THAT USE OF FLOW EQUALIZATION DID NOT RESULT IN POWER COST ECONOMIES. (BB)

TITLE EFFLUENT MONITORING PROCEDURES: BASIC PARAMETERS FOR MUNICIPAL EFFLUENTS. STAFF GUIDE.
PUB DATE 77
DESC CHEMISTRY, COURSE DESCRIPTIONS, *EDUCATIONAL PROGRAMS, ENVIRONMENTAL EDUCATION, *INSTRUCTIONAL MATERIALS, *LABORATORY TECHNIQUES, MICROBIOLOGY, *POLLUTION, POST SECONDARY EDUCATION, SKILL DEVELOPMENT, *WATER POLLUTION CONTROL, *WASTEWATER TREATMENT, *EFFLUENTS, *MONITORING

ERIC NO. ED147194
EDRS PRICE EDRS PRICE MF-$0.83 HC-$16.73 PLUS POSTAGE.
DESC NOTE 315P.; FOR RELATED DOCUMENTS, SEE SE 023 377-383; AS NOTED IN THE TABLE OF CONTENTS, SECTIONS 18 AND 27 ARE NOT INCLUDED IN THE PAGINATION
ISSUE RIEAPR78
ABSTRACT THIS IS ONE OF SEVERAL SHORT-TERM COURSES DEVELOPED TO ASSIST IN THE TRAINING OF WASTE WATER TREATMENT PLANT OPERATIONAL PERSONNEL IN THE TESTS, MEASUREMENTS, AND REPORT PREPARATION REQUIRED FOR COMPLIANCE WITH THEIR NPDES PERMITS. THIS STAFF GUIDE PROVIDES STEP-BY-STEP GUIDELINES ON COURSE PLANNING, DEVELOPMENT AND IMPLEMENTATION INVOLVING CLASSROOM INSTRUCTION AND LABORATORY APPLICATION OF CRITICAL LEARNING OUTCOMES. PART I IS CONCERNED WITH THE ADMINISTRATIVE ASPECTS OF THE TRAINING PROGRAM, PART II CONSISTS OF INSTRUCTIONAL STAFF GUIDELINES ON TECHNICAL CONTENT, LEARNING OBJECTIVES, AND LESSON-BY-LESSON GUIDES FOR THE SELF-MONITORING PROCEDURES CONTAINED IN THIS COURSE. INCLUDED IN THIS DOCUMENT ARE MATERIALS RELATED TO DETERMINING DISSOLVED OXYGEN, PH, FECAL COLIFORM, WATER FLOW, SUSPENDED SOLIDS, AND CHLORINE. (CS)

TITLE EFFLUENT MONITORING PROCEDURES: NUTRIENTS. STAFF GUIDE.
PUB DATE 77
DESC COURSE DESCRIPTIONS, *EDUCATIONAL PROGRAMS, ENVIRONMENTAL EDUCATION, *INSTRUCTIONAL MATERIALS, *LABORATORY TECHNIQUES, *POLLUTION, POST SECONDARY EDUCATION, SKILL DEVELOPMENT, TEACHING METHODS, *WATER POLLUTION CONTROL, *WASTEWATER TREATMENT, *EFFLUENTS, *MONITORING, *NUTRIENTS
EDRS PRICE EDRS PRICE MF-$0.83 HC-$12.71 PLUS POSTAGE
DESC NOTE 247P., FOR RELATED DOCUMENTS, SEE SE 023 377-383, SOME PAGES MAY REPRODUCE POORLY DUE TO PRINT QUALITY.
ISSUE RIEAPR78
ABSTRACT THIS IS ONE OF SEVERAL SHORT-TERM COURSES DEVELOPED TO ASSIST IN THE TRAINING OF WASTE WATER TREATMENT PLANT OPERATIONAL PERSONNEL IN THE TESTS MEASUREMENTS, AND REPORT PREPARATION REQUIRED FOR COMPLIANCE WITH THEIR NPDES PERMITS. THIS STAFF GUIDE PROVIDES STEP-BY-STEP GUIDELINES ON COURSE PLANNING, DEVELOPMENT AND IMPLEMENTATION INVOLVING CLASSROOM INSTRUCTION AND LABORATORY APPLICATION OF CRITICAL LEARNING OUTCOMES. PART I IS CONCERNED WITH THE ADMINISTRATIVE ASPECTS OF THE TRAINING

PROGRAM. PART II CONSISTS OF INSTRUCTIONAL STAFF GUIDELINES ON TECHNICAL CONTENT, LEARNING OBJECTIVES, AND LESSON-BY-LESSON GUIDES FOR THE SELF-MONITORING PROCEDURES CONTAINED IN THIS COURSE. INCLUDED ARE A VARIETY OF TECHNIQUES FOR DETERMINING VARIOUS MATERIALS IN WATER INCLUDING PHOSPHORUS, NITROGEN, AMMONIA, CADMIUM, OIL, AND GREASE. (CS)

TITLE FACILITIES FOR CONTROLLING THE ACTIVATED SLUDGE PROCESS BY MEAN CELL RESIDENCE TIME
AUTHOR BURCHETT, M.E.; TCHOBANDOGLOUS, G.
CORP AUTH YODER-TROTTER-ORLOB AND ASSOCIATES, WALNUT CREEK, CALIF.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 46, NO 5, P 973-979, MAY 1974. 7 FIG, 6 REF.
IDEN *MEAN CELL RESIDENCE TIME.
KEYWORDS *ACTIVATED SLUDGE, *TREATMENT FACILITIES, *CONTROL SYSTEMS, AUTOMATIC CONTROL, OPERATION AND MAINTENANCE, *WASTE WATER TREATMENT
ABSTRACT SEVERAL METHODS NOW BEING USED BY OPERATORS TO CONTROL THE ACTIVATED SLUDGE PROCESS ARE DISCUSSED. THE USE OF THE MEAN CELL RESIDENCE TIME (MCRT) IS RECOMMENDED AS THE MOST SUITABLE OPERATIONAL CONTROL PARAMETER. THE BASIC CONCEPTS INVOLVING THE THEORETICAL AND PRACTICAL REASONS FOR CONTROLLING THE MCRT ARE DISCUSSED. THE PHYSICAL FEATURES OF A CONTROL SYSTEM DEVELOPED TO USE THIS METHOD ARE PRESENTED. THE FOLLOWING ADVANTAGES FOR THE PROPOSED CONTROL SYSTEM ARE: MINIMUM REQUIRED OPERATOR ATTENTION, INEXPENSIVE CAPITAL COSTS, MORE POSITIVE PROCESS CONTROL, AND MORE STABLE PROCESS OPERATION. (SA

TITLE GET THE MOST FROM THE FINAL CLARIFIERS.
AUTHOR BOYLE, W. H.
CORP AUTH ENVIREX INC., WAUKESHA, WIS.
AVAIL WATER AND WASTES ENGINEERING, VOL 12, NO 10, P 53-55, 82, OCTOBER, 1975. 4 FIG.
IDEN *CLARIFIERS, HYDRAULIC REMOVAL MECHANISMS, SLUDGE RETURN.
KEYWORDS *WASTE WATER TREATMENT, *ACTIVATED SLUDGE, HYDRAULIC MACHINERY, HYDRAULICS, SLUDGE, DESIGN.
ABSTRACT THE FINAL CLARIFIER PERFORMS ONE OF THE MOST IMPORTANT UNIT FUNCTIONS IN THE ACTIVATED SLUDGE PROCESS. THE HYDRAULIC REMOVAL MECHANISM, SOMETIMES CALLED A VACUUM OR SUCTION TYPE DEVICE, IS THE PREFERRED SLUDGE COLLECTION MECHANISM WHEN DEALING WITH A LIGHT FLOCCULANT SLUDGE. A BRIEF

REVIEW IS PRESENTED OF THE MAIN REQUIREMENTS FOR A HYDRAULIC REMOVAL MECHANISM WHICH ARE RAPID SLUDGE REMOVAL, MINIMUM SLUDGE AGITATION, MAXIMUM SOLIDS CONCENTRATION, FLEXIBILITY, AND BALANCED HYDRAULIC DESIGN. ONE OF THE TWO MAIN TYPES OF CIRCULAR HYDRAULIC REMOVAL MECHANISMS IS A RECTANGULAR TAPERED HEADER MADE OF 0.25 INCH STEEL PLATE WITH ORIFICES DRILLED INTO THE HEADER FOR THE REMOVAL OF SLUDGE (THE HEADER DESIGN). THE OTHER DEVICE INCORPORATES SEVERAL WITHDRAWAL PIPES WITH THE SLUDGE CHANNELED BY DEFLECTOR PLATES TO THESE PIPES AND TRANSPORTED TO COLLECTION WELLS (RISER PIPE DESIGN). THE HYDRAULIC DESIGN OF EACH OF THESE DEVICES IS EXPLAINED. CHOICE OF HYDRAULIC SLUDGE REMOVAL MECHANISM SHOULD BE BASED ON PERFORMANCE, HOW THE DEVICE AFFECTS THE MAIN PROCESS REQUIREMENTS, AND AN ECONOMIC EVALUATION OF CAPITAL AND OPERATIONAL/MAINTENANCE EXPENDITURES. (ORR-FIRL)

TITLE GUIDE TO WASTEWATER TREATMENT: BIOLOGICAL-SYSTEM DEVELOPMENTS.

AUTHOR FORD, D. L.; TISCHLER, L. F.

CORP AUTH ENGINEERING-SCIENCE, INC., AUSTIN, TX.

AVAIL CHEMICAL ENGINEERING, VOL 84, NO 17, P 131-135, AUGUST, 1977. 2 FIG. 13 REF.

KEYWORDS *BIOLOGICAL TREATMENT, *INDUSTRIAL WASTES, *ACTIVATED SLUDGE, *TRICKLING FILTERS, *BIODEGRADATION, EQUALIZING RESERVOIRS, ORGANIC LOADING, DILUTION, SOLVENT EXTRACTIONS, SUSPENDED SOLIDS, DESIGN CRITERIA, NITRIFICATION, FILTRATION, *WASTE WATER TREATMENT

ABSTRACT HIGH-RATE BIOLOGICAL TREATMENT SYSTEMS SUCH AS ACTIVATED SLUDGE, TRICKLING FILTERS, AND ROTATING DISCS ARE REVIEWED FOR USE IN MUNICIPAL AND INDUSTRIAL WASTE WATER TREATMENT. VARIOUS ASPECTS OF SUSPENDED-GROWTH SYSTEMS SUCH AS THE COMPLETELY-MIXED ACTIVATED SLUDGE PROCESS ARE DISCUSSED, INCLUDING CONTACT STABILIZATION, SOLIDS REMOVAL, AND EFFLUENT POLISHING. FIXED-GROWTH SYSTEMS SUCH AS THE CONVENTIONAL TRICKLING FILTER AND THE ROTATING BIOLOGICAL FILTER ARE DESCRIBED AND COMPARED WITH SUSPENDED-GROWTH SYSTEMS. FLOW EQUALIZATION AND AUXILIARY BASINS IN INDUSTRIAL WASTE WATER TREATMENT ARE SUGGESTED TO OFFSET PROBLEMS ASSOCIATED WITH HYDRAULIC- AND ORGANIC-LOAD VARIATIONS TO BIOLOGICAL SYSTEMS. PRETREATMENT WITH HYDROLYSIS IS SUGGESTED TO ENHANCE BIODEGRADABILITY. PRE-DILUTION OF INFLUENT

142

STREAMS HAVING HIGH ORGANIC CONCENTRATIONS BY STREAMS HAVING LOW ORGANIC CONCENTRATIONS IS SUGGESTED TO IMPROVE OVERALL PERFORMANCE OF A BIOLOGICAL SYSTEM. STEAM OR SOLVENT STRIPPING OF INDUSTRIAL WASTE STREAMS IS RECOMMENDED TO REDUCE HIGH-ORGANIC LOADS, MINIMIZE LOADING VARIATIONS, AND REDUCE INHIBITION OF BIOLOGICAL PROCESSES BY PARTICULARLY TOXIC WASTES. INCREASING THE AMOUNT OF BIOLOGICAL SOLIDS IN THE AERATION BASIN OF SUSPENDED GROWTH SYSTEMS BY INCREASING THE SLUDGE-RECYCLE RATIO AND/OR REDUCING SLUDGE WASTAGE IS REPORTED TO PREVENT BIOLOGICAL UPSET. VARIOUS PROCESSES USED IN THE REMOVAL OF SECONDARY SOLIDS ARE DISCUSSED. DESIGN AND OPERATIONAL VARIABLES WHICH CAN AFFECT PROCESS PERFORMANCE ARE DISCUSSED, INCLUDING SLUDGE AGE, TEMPERATURE, SLUDGE BULKING, NITRIFICATION, AND ACTIVATED CARBON TREATMENT. ((SCHULZ-FIRL)

TITLE HANDBOOK FOR WATER AND WASTEWATER ANALYSIS.
PUB DATE 76
AVAIL VWR SCIENTIFIC, PO BOX 3200, SAN FRANCISCO, CA 94119
DESC *ANALYTICAL TECHNIQUES, CHEMICAL ANALYSIS, *INSTRUCTIONAL MATERIALS, *LABORATORY TECHNIQUES, *MANUALS, POST SECONDARY EDUCATION, *WATER ANALYSIS
ABSTRACT ANALYTICAL TECHNIQUES FOR USE IN WATER AND WASTEWATER LABORATORIES.

TITLE HANDBOOK OF ADVANCED WASTEWATER TREATMENT, 2ND EDITION
AUTHOR CULP, RUSSELL L.; AND OTHERS
PUB DATE 78
AVAIL VAN NOSTRAND/REINHOLD CO., 300 PIKE ST., CINCINNATI, OH 45202
DESC CARBON DIOXIDE, *CHEMISTRY, CHLORINATION, DEMINERALIZATION, *DISINFECTION, *ECONOMICS, FILTRATION, FLOCCULATION, *HIGHER EDUCATION, *INSTRUCTIONAL MATERIALS, *LAND APPLICATION, *OPERATIONS (WASTEWATER), POST SECONDARY EDUCATION, *SLUDGE, WASTEWATER SLUDGE, *WASTEWATER TREATMENT, *WATER POLLUTION CONTROL
DESC NOTE 632P.
ABSTRACT INCLUDED IN THIS BOOK ARE CHAPTERS ON THE PURPOSE AND BENEFITS OF ADVANCED WASTEWATER TREATMENT, CHEMICAL CLARIFICATION, RECARBONATION, FILTRATION, ACTIVATED CARBON ADSORPTION AND REGENERATION, DISINFECTION, NITROGEN REMOVAL, CHEMICAL SLUDGE

HANDLING, DEMINERALIZATION, LAND TREATMENT OF WASTEWATERS, ESTIMATING THE COSTS OF WASTEWATER TREATMENT FACILITIES AND SELECTING AND COMBINING UNIT PROCESSES. SOME OF THE TOPICS INCLUDED ARE: (1) COAGULATION, FLOCCULATION, AND SEDIMENTATION; (2) SINGLE STAGE VS, TWO STAGE CARBONATION; (3) DESIGN OF FILTER SYSTEMS; (4) EVALUATION OF ACTIVATED CARBON; (5) CHLORINATION; (6) BIOLOGICAL NITROGEN REMOVAL; (7) ELECTRODIALYSIS; AND (8) ION EXCHANGE. THIS BOOK CONTAINS DESIGN EXAMPLES AND CASE HISTORIES OF OPERATING PLANTS. IT IS USEFUL AS A REFERENCE BOOK, OR A TEXT IN GRADUATE OR UNDERGRADUATE ENVIRONMENTAL ENGINEERING COURSES. (BB)

TITLE THE IMPACT OF OILY MATERIAL ON ACTIVATED SLUDGE SYSTEMS.

CORP AUTH HYDROSCIENCE, INC., WESTWOOD, N.J.

AVAIL COPY AVAILABLE FROM GPO SUP DOC AS SN5501-0088, $1.25; MICROFICHE FROM NTIS AS PB-212 422, $0.95. ENVIRONMENTAL PROTECTION AGENCY, WATER POLLUTION CONTROL RESEARCH SERIES, MARCH 1971, 110 P, 29 FIG, 10 TAB, 38 REF. EPA PROGRAM 12050 DSH 03/71.

IDEN *SPENT CRANKCASE OIL, *VEGETABLE OIL, *CRUDE OIL, REFINERY WASTE OIL, LOAD TOLERANCE.

KEYWORDS *OIL WASTES, *ACTIVATED SLUDGE, *SEWAGE TREATMENT, *WASTE WATER DISPOSAL, BIOLOGICAL TREATMENT, OIL, BIODEGRADATION, ABSORPTION, SLUDGE TREATMENT

ABSTRACT THE PREFORMANCE OF SMALL SCALE CONTINUOUS ACTIVATED SLUDGE SYSTEMS WAS OBSERVED AFTER BEING EXPOSED TO A VAREITY OF OILY COMPOUNDS SUCH AS CRANKCASE OIL, CRUDE OIL AND VEGETABLE OIL, AT SEVERAL LOADING LEVELS. BATCH STUDIES WERE CONDUCTED TO DETERMINE BIODEGRADABILITY AND THE EFFECT OF EMULSIFICATION AND TEMPERATURE ON THE RATE OF BIOLOGICAL REACTION. OILS ARE ABSORBED ON THE FLOC AND SLOWLY DEGRADE WHEN THEY ARE INTRODUCED INTO AN ACTIVATED SLUDGE SYSTEM. THE OIL ACCUMULATES ON THE SLUDGE CAUSING A LOSS OF DENSITY AND ACCEPTABLE SETTLING CHARACTERISTICS IF THE LOADING RATE IS HIGHER THAN THE DEGRADATION WASTAGE. THE ABILITY OF THE MICROBIAL SYSTEM TO REMOVE OTHER SUBSTRATES IS NOT INHIBITED ALTHOUGH THE BIOLOGICAL SYSTEM FAILS DUE TO THE LOSS OF SLUDGE. 0.10 POUNDS PER DAY PER POUND OF SLUDGE UNDER AERATION SHOULD BE THE MAXIMUM CONTINUOUS FEED LEVEL OF OILS TO ACTIVATED SLUDGE. SHOCK LOADS SHOULD NOT EXCEED 5% OF THE WEIGHT OF THE SLUDGE UNDER AERATION. (SMITH-TEXAS)

144

TITLE	IS INADEQUATE SLUDGE AGE AND DISSOLVED OXYGEN CONTROL PREVENTING OPERATORS FROM GETTING THE BEST FROM THEIR ACTIVATED-SLUDGE PLANTS.
AUTHOR	PITMAN, A. R.
PUB DESC	WATER POLLUTION CONTROL, VOL 77, NO 1, P 97-99, 1978. 1 FIG.
KEYWORDS	*ACTIVATED SLUDGE, *DISSOLVED OXYGEN, *FLOCCULATION, *SUSPENDED SOLIDS, *OPTIMIZATION, OXYGEN DEMAND, BACTERIA, PROTOZOA, WASTE WATER TREATMENT, SLUDGE DIGESTION, MUNICIPAL WASTES.
ABSTRACT	THE OPTIMIZATION OF THE ACTIVATED SLUDGE WASTE WATER TREATMENT PROCESS IS CONSIDERED WITH RESPECT TO SLUDGE AGE AND DISSOLVED OXYGEN CONTROL. CLARIFIER CAPACITY INCREASES AT A CONSTANT FEED RATE OF HOMOGENOUS SLUDGE AND A DISSOLVED OXYGEN LEVEL OF 2 MG/LITER. AS SLUDGE AGE INCREASES UNDER THESE CIRCUMSTANCES, EFFLUENT CLARITY IMPROVES DUE TO INCREASED BIOFLOCCULATION EFFICIENCY; THE SLUDGE SETTLING RATE INCREASES WITH HIGHER FLOC DENSITY; AND THE QUANTITY OF SLUDGE PRODUCED DECREASES. THE OXIDATION OF ORGANIC NITROGEN AND AMMONIA ALSO IMPROVES WHILE THE FLOC OXYGEN DEMAND AND MIXED LIQUOR SUSPENDED SOLIDS INCREASE. AS SLUDGE AGE INCREASES, OPTIMUM CONDITIONS ARE APPROACHED. THESE INCLUDE THE REDUCTION OF THE PROTOZOA POPULATION, THE PRESENCE OF BACTERIA IN THE ENDOGENOUS GROWTH PHASE, THE DETERIORATION OF BIOFLOCCULATION, AND THE CONTINUING INCREASE OF FLOC DENSITY, SUSPENDED SOLIDS, TOTAL OXYGEN DEMAND, AND CLARIFIER SOLIDS LEVELS. WHEN SLUDGE AGE EXCEEDS THE OPTIMUM CONDITIONS, DEFLOCCULATION OCCURS. TWO EXAMPLES OF EFFLUENT DEFLOCCULATION ARE PRESENTED. IN ONE CASE, CONTROL OF THE DISSOLVED OXYGEN LEVEL BELOW CAPACITY IMPROVES THE CLARIFIED EFFLUENT QUALITY. IN THE SECOND CASE, REDUCING SLUDGE AGE IMPROVES THE AMBIENT DISSOLVED OXYGEN LEVEL. (LISK-FIRL)

TITLE	INTERMEDIATE ACTIVATED SLUDGE. TRAINING MODULE 2.116.3.77.
PUB DATE	SEP 77
DESC	*INSTRUCTIONAL MATERIALS, *POST SECONDARY EDUCATION, SECONDARY EDUCATION, *TEACHING GUIDES, *UNITS OF STUDY, *WATER POLLUTION CONTROL: *ACTIVATED SLUDGE, OPERATIONS (WASTEWATER), *WASTEWATER TREATMENT
ERIC NO.	ED151221
EDRS PRICE	EDRS PRICE MF-$0.83 HC-$4.67 PLUS POSTAGE.
DESC NOTE	89P.; FOR RELATED DOCUMENTS SEE SE 024 025-047;

PAGE 81 MISSING FROM DOCUMENT PRIOR TO BEING SHIPPED TO EDRS FOR FILMING; BEST COPY AVAILABLE

ISSUE RIEJUL78

ABSTRACT THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH OPERATION OF ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS AND TRANSPARENCY MASTERS. THIS IS THE SECOND LEVEL OF A THREE MODULE SERIES AND CONSIDERS AERATION DEVICES, PROCESS CONTROL PROCEDURES, MICROORGANISMS AND DATA TREND CHART PLOTTING. (AUTHOR/RH)

TITLE INTRODUCTION TO WASTEWATER TREATMENT PROCESSES.

AUTHOR RAMALHO, R. S.

PUB DATE 77

AVAIL ACADEMIC PRESS, 111 FIFTH AVE., NEW YORK, NY 10003

DESC BIOLOGY, CHEMISTRY, *ENGINEERING, *ENVIRONMENTAL INFLUENCES, EQUIPMENT, FACILITIES, *INSTRUCTIONAL MATERIALS, LAND USE, *POLLUTION, POST SECONDARY EDUCATION, PROBLEM SOLVING, *WASTE DISPOSAL, WATER QUALITY, *WATER POLLUTION CONTROL, *OPERATIONS (WASTEWATER), *WASTEWATER TREATMENT, *FACILITIES

DESC NOTE 409P.

ABSTRACT THIS BOOK INTRODUCES FUNDAMENTAL PROCESSES OF WASTEWATER TREATMENT. THE TEXT IS DESIGNED TO TRAIN THE READER IN EVALUATION OF WASTEWATER TREATMENT PROBLEMS SO THAT PROPER PROCESSES AND EQUIPMENT MAY BE SELECTED. FOR EACH PROCESS THE TEXT PROVIDES: (1) A SUMMARY OF THEORY, INVOLVED IN THAT PROCESS, (2) DEFINITION OF IMPORTANT DESIGN PARAMETERS INVOLVED IN THE PROCESS, AND (3) DEVELOPMENT OF A SYSTEMATIC DESIGN PROCEDURE FOR THE TREATMENT PLANT. EVERY STEP OF THIS SEQUENCE IS ILLUSTRATED WITH NUMERICAL EXAMPLES. (CS)

TITLE LABORATORY CONTROL FOR WASTEWATER FACILITIES, WASTEWATER TECHNOLOGY: A TWO-YEAR POST HIGH SCHOOL INSTRUCTIONAL PROGRAM. VOLUME III, PARTS A, B, C, D, E, F, G.

AUTHOR WAGNER, DAVID; AND OTHERS

PUB DATE JUL 76

DESC BEHAVIORAL OBJECTIVES, CURRICULUM, ENVIRONMENT, *ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, LABORATORY PROCEDURES, *LABORATORY TECHNIQUES, *POLLUTION, POST SECONDARY EDUCATION, *WATER POLLUTION CONTROL, *WASTEWATER TREATMENT

ERIC NO. ED148582

EDRS PRICE EDRS PRICE MF-$0.83 HC-$20.75 PLUS POSTAGE
DESC NOTE 377P.; FOR RELATED DOCUMENTS, SEE SE 023 408-410 AND SE 023 432; CONTAINS OCCASIONAL LIGHT TYPE.
ISSUE RIEMAY78
ABSTRACT THIS VOLUME IS ONE IN A SERIES WHICH OUTLINES PERFORMANCE OBJECTIVES AND INSTRUCTIONAL MODULES FOR A COURSE OF STUDY WHICH EXPLAINS THE RELATIONSHIP AND FUNCTION OF THE PROCESS UNITS IN A WASTEWATER TREATMENT PLANT. EXAMPLES OF MODULES INCLUDE MEASURING SETTLEABLE MATTER, TOTAL SOLIDS, DISSOLVED SOLIDS, SUSPENDED SOLIDS, AND VOLATILE SOLIDS. THE MODULES ARE ARRANGED IN AN ORDER APPROPRIATE FOR TEACHING STUDENTS WITH NO EXPERIENCE. THEY CAN ALSO BE REARRANGED AND ADAPTED FOR COURSES TO UPGRADE PERSONNEL MOVING INTO SUPERVISORY POSITIONS OR DESIGNED AS A MINICOURSE. EACH MODULE CONTAINS A STATEMENT OF PURPOSE, OBJECTIVES, CONDITIONS, ACCEPTABLE PERFORMANCE, INSTRUCTOR ACTIVITY AND STUDENT ACTIVITY. THE TASKS ARE ORGANIZED IN THE GENERAL CATEGORIES: NORMAL OPERATIONS, ABNORMAL OPERATIONS, PREVENTIVE MAINTENANCE, CORRECTIVE MAINTENANCE, LABORATORY CONTROL, SYSTEMS INTERACTION, AND MANAGEMENT/SUPERVISORY PROCEDURES. INCLUDED IN THIS VOLUME ARE 29 MODULES. THE MODULES ARE DESIGNED TO TEACH THE STUDENT LABORATORY PROCEDURES FOR ANALYZING VARIOUS POLLUTANTS AND VARIABLES RELATED TO WASTEWATER. MOST STANDARD TESTS ARE INCLUDED. (CS)
INSTITUTION NAME CHARLES COUNTY COMMUNITY COLL., LA PLATA, MD.; CLEMSON UNIV., S.C.; GREENVILLE TECHNICAL COLL., S.C.; LINN-BENTON COMMUNITY COLL., ALBANY, OREG.

TITLE MANUAL FOR ACTIVATED SLUDGE SEWAGE TREATMENT.
AUTHOR GOODMAN, B. L.
PUB DATE 71
AVAIL TECHNOMIC PUBLISHING CO., INC., 265 WEST STATE STREET, WESTPORT, CT 06880
DESC *ACTIVATED SLUDGE, ENVIRONMENTAL TECHNICIANS, INSERVICE EDUCATION, *INSTRUCTIONAL MATERIALS, *MANUALS, *POST SECONDARY EDUCATION, *SLUDGE, *WASTE DISPOSAL, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL
DESC NOTE 204P.
ABSTRACT STEP BY STEP EXPLANATION OF THE PROCESS, FROM BASICS TO FINE POINTS OF ADVANCED WASTEWATER TREATMENT METHODS.

TITLE MANUAL OF INSTRUCTION FOR SEWAGE TREATMENT PLANT OPERATORS.

PUB DATE 65

AVAIL HEALTH EDUCATION SERVICE, PO BOX 7283, ALBANY, NY 12224 ($2.00)

DESC ANALYTICAL TECHNIQUES, *INSTRUCTIONAL MATERIALS, MAINTENANCE, *MANUALS, *OPERATIONS, *POST SECONDARY EDUCATION, PRIMARY TREATMENT, RECORD KEEPING, *SEWAGE, SLUDGE, *WASTE DISPOSAL, WASTEWATER CHARACTERISTICS, WASTEWATER SLUDGE, *WASTEWATER TREATMENT

DESC NOTE 243P.

ABSTRACT PREPARED FOR GRADE 2 OPERATORS, WRITTEN PRIMARILY AS A TEXT TO BE USED IN CONJUNCTION WITH TRAINING COURSE. HEAVILY NARRATIVE, AVOIDS OVERLY TECHNICAL TREATMENT, AND PRESENTS MATERIAL CONCISELY, APPENDICES SUPPORT BACKGROUND MATERIAL (EG ARITHMETIC, CHEMISTRY, BACTERIOLOGY, ETC). GLOSSARY.

TITLE MANUAL OF INSTRUCTION FOR WASTE TREATMENT PLANT OPERATORS.

AVAIL HEALTH EDUCATION SERVICE, PO BOX 7126, ALBANY, NY 12224 ($2.00)

DESC *CHEMICAL ANALYSIS, *ENVIRONMENT, *INSTRUCTIONAL MATERIALS, NATURAL RESOURCES, *OPERATIONS (WATER), POST SECONDARY EDUCATION, WASTEWATER TREATMENT, *WATER ANALYSIS, WATER POLLUTION CONTROL, *WATER QUALITY

DESC NOTE 308P.

ABSTRACT THIS MANUAL IS INTENDED TO BE A TEXTBOOK FOR A WATER TREATMENT OPERATORS COURSE. IT CONTAINS CHAPTERS ON THE PURPOSE OF WATER TREATMENT, WATER SOURCES AND USES, HYDRAULICS AND ELECTRICITY, WATER CHEMISTRY, MICROBIOLOGY, WATER QUALITY, CHEMICAL COAGULATION, SEDIMENTATION, FILTRATION, CHLORINATION, SOFTENING, AERATION, IRON AND MAGNESIUM, TASTE AND ODOR CONTROL, CORROSION, FLUORIDATION, PROTECTION OF TREATED WATER, RECORDS AND REPORTING, TREATMENT PLANT MAINTENANCE AND ACCIDENT PREVENTION, MATHEMATICS, AND LABORATORY EXAMINATION OF WATER. THE MANUAL SHOULD BE UNDERSTANDABLE TO THE AVERAGE PLANT OPERATOR WITH A HIGH SCHOOL EQUIVALENT BACKGROUND. EXTREMELY TECHNICAL MATERIAL HAS BEEN AVOIDED. (BB)

TITLE A MANUAL OF SIMPLIFIED LABORATORY METHODS FOR OPERATORS OF WASTEWATER TREATMENT FACILITIES.

AUTHOR WESTERHOLD, ARNOLD F., ED.; BENNETT, ERNEST C., ED

PUB DATE	APR 74
DESC	CHEMISTRY, ENVIRONMENTAL EDUCATION, *ENVIRONMENTAL TECHNICIANS, INDEPENDENT STUDY, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *LABORATORY TECHNIQUES, *POLLUTION, *POST SECONDARY EDUCATION, PUBLIC HEALTH, *WATER POLLUTION CONTROL, *WASTEWATER TREATMENT
ERIC NO.	ED149972
EDRS PRICE	EDRS PRICE MF-$0.83 HC-$4.67 PLUS POSTAGE. 94P., PAGES 1-1 THROUGH 1-12 (GENERAL INTRODUCTION) REMOVED DUE TO COPYRIGHT RESTRICTION; SECTION 8 MISSING; CONTAINS OCCASIONAL LIGHT TYPE; BEST COPY AVAILABLE
ISSUE	RIEJUN78
ABSTRACT	THIS MANUAL IS DESIGNED TO PROVIDE THE SMALL WASTEWATER TREATMENT PLANT OPERATOR, AS WELL AS THE NEW OR INEXPERIENCED OPERATOR, WITH SIMPLIFIED METHODS FOR LABORATORYY ANALYSIS OF WATER AND WASTEWATER. IT IS EMPHASIZED THAT THIS MANUAL IS NOT A REPLACEMENT FOR STANDARD METHODS BUT A GUIDE FOR PLANTS WITH INSUFFICIENT EQUIPMENT TO PERFORM ANALYSES IN ACCORDANCE WITH STANDARD METHODS. EACH OF THE SECTIONS IS DESIGNED TO BE COMPLETE WITHIN ITSELF. THE TESTS AND MEASUREMENTS PRESENTED INCLUDE: ACIDS, BIOCHEMICAL OXYGEN DEMAND (BOD), DISSOLVED OXYGEN, RESIDUES, SLUDGE, AND SUSPENDED SOLIDS. (CS)
INSTITUTION NAME	ILLINOIS STATE ENVIRONMENTAL PROTECTION AGENCY, SPRINGFIELD.

TITLE	THE MATHEMATICS OF ACTIVATED SLUDGE CONTROL.
AUTHOR	UHTE, WARREN R.
CORP AUTH	BROWN AND CALDWELL, SAN FRANCISCO, CALIF.
AVAIL	JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 42, NO 7, P 1292-1304, JULY 1970. 1 FIG, 1 TAB.
IDEN	SUSPENDED SOLIDS, WASTING, COMPUTATION, PROCESS CONTROL.
KEYWORDS	*MATHEMATICAL MODEL, *ACTIVATED SLUDGE, *CONTROL, SLUDGE, KINETICS, DESIGN.
ABSTRACT	FOR THE USE OF THE MEAN CELL RESIDENCE OR THE SOLIDS RETENTION TIME IN THE CONTROL OF AN ACTIVATED SLUDGE SYSTEM, ONE MUST SELECT THE DESIRED TIME, COMPUTE THE TOTAL SOLIDS PRESENT IN THE SYSTEM AND DETERMINE THE TOTAL VOLATILE SOLIDS TO BE WASTED PER DAY. THE SOLIDS IN THE SYSTEM MAY BE EXPRESSED AS THE SUM OF THOSE IN THE AERATION FACILITIES SECONDARY SEDIMENTATION UNITS AND THE SLUDGE RETURN SYSTEM. SOLIDS ARE WASTED BOTH OVER

THE EFFLUENT WEIR AND THROUGH THE SOLIDS DISPOSAL SYSTEM. NUMERICAL EXAMPLES SHOW THESE COMPUTATIONS FOR CONVENTIONAL, STEP FEED, HIGH RATE AND MULTIPLE STEP OPERATIONS OF AN HYPOTHETICAL PLANT. ASSUMED PLANT DESIGN IS FOR AN 18 MGD FLOW. THE PLANT LAYOUT INCLUDES FOUR AERATION TANKS, MIXED LIQUOR CHANNEL AND RETURN ACTIVATED SLUDGE CHANNEL, AND FOUR SECONDARY SEDIMENTATION BASINS. (HANCUFF-TEXAS)

TITLE MAXIMIZING PHOSPHORUS REMOVAL IN ACTIVATED SLUDGE.
AUTHOR ELLIOTT, W. R.; RIDING, J. T.; SHERRARD, J. H.
CORP AUTH. VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF CIVIL ENGINEERING.
PUB DESC WATER AND SEWAGE WORKS, VOL 125, NO 3, P 88-92, MARCH, 1978. 38 REF.
KEYWORDS *PHOSPHORUS, *BIOLOGICAL TREATMENT, *ACTIVATED SLUDGE, *CHEMICAL PERCIPITATION, NUTRIENT REMOVAL, ABSORPTION, BIODEGRADATION, CALCIUM CARBONATE, LIME, PILOT PLANTS, LABORATORY TESTS, HARDNESS (WATER), PHOSPHATES, LIMITING FACTORS, PUBLICATIONS, WASTE WATER TREATMENT, MUNICIPAL WASTES.
ABSTRACT IMPROVING PHOSPHORUS REMOVAL IN ACTIVATED SLUDGE BY MICROBIAL GROWTH, EXCESS UPTAKE, AND CHEMICAL PRECIPITATION WAS DISCUSSED IN A REVIEW OF PUBLISHED EXPERIMENTAL DATA AND ON-SITE TESTS IN WASTE WATER TREATMENT PLANTS. LABORATORY DATA ON MICROBIAL UPTAKE IDENTIFIED THE C:P RATIO AS A LIMITING FACTOR IN PHOSPHORUS REMOVAl; THE HIGHER COD:P RATIO PROVIDED MORE OF THE STOICHIOMETRIC REQUIREMENT. VARIATIONS IN MEAN CELL RESIDENCE TIME AFFECTED PHOSPHORUS REMOVAL, ALTHOUGH THE AVERAGE SLUDGE PHOSPHORUS CONTENT OF 2-3% BY WEIGHT WAS NOT SIGNIFICANTLY IMPROVED. ENHANCED PHOSPHORUS REMOVAL WAS ACHIEVED IN PLUG FLOW REACTORS WITH DISSOLVED OXYGEN CONTROL AT PH6; ANAEROBIC CONDITIONS WERE AVOIDED BY ADEQUATE SLUDGE REMOVAL. BATCH STUDIES ON EXCESS UPTAKE DEMONSTRATED THAT 80% REMOVAL OCCURRED FOR A LOW PHOSPHATE CONCENTRATION, 5MG/LITER, IN THE PRESENCE OF A HIGH MICROBIAL POPULATION. THE PRESENCE OF NA(+) AND K AND THE RATE OF AERATION WERE CITED AS LIMITING FACTORS IN EXCESS PHOSPHORUS UPTAKE. FULL-SCALE STUDIES VERIFIED THAT PHOSPHORUS WAS RELEASED INTO THE EFFLUENT STREAM UNDER ANAEROBIC CONDITIONS. PRECIPITATION WITH CACO3 RESULTED IN HYDROLYSIS OF PHOSPHATES AT THE HEAD OF THE AERATION TANK, DECREASED CO2

GENERATION, AND THE FORMATION OF CALCIUM PHOSPHATE SLUDGE. THE OPTIMUM CONDITIONS FOR PHOSPHORUS REMOVAL IN A PLUG FLOW SYSTEM WERE CONCLUDED TO BE: PH 7.5-8.5 LESS THAN 350 MG/LITER CACO3, AND 24 MG/LITER MG(++). (LISK- FIRL)

TITLE THE METAZOA OF WASTE TREATMENT PROCESSES-ROTIFERS.
AUTHOR CALAWAY, W. T.
CORP AUTH FLORIDA UNIV., GAINESVILLE.
AVAIL JOURNAL OF WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 11, PART 2, P R412-R422, NOV. 1968. 3 FIG, 0 TAB, 23 REF.
IDEN *METAZOA
DESC *ACTIVATED SLUDGE, *ROTIFERS, *MICROBIOLOGY, *EFFICIENCIES, TREATMENT, WASTE TREATMENT, TRICKLING FILTER, SEWAGE TREATMENT, ANIMALS, WASTE WATER TREATMENT.
ABSTRACT DIFFERENT WASTE WATER TREATMENT PROCESSES DEVELOP DIFFERENT CHARACTERISTICS FAUNA. THE ACTIVATED SLUDGE PROCESS COMMONLY SUPPORTS ROTIFERS AS ITS PRINCIPAL METAZOA, TRICKLING FILTERS SUPPORT POPULATIONS OF ROTIFERS, ROUND WORMS, AND ANNELIDS, AND THE METAZOA OF LAGOONS VERY WIDELY. ALTHOUGH THE METAZOA SOMETIMES CAUSE TREATMENT PROBLEMS THEY CONSUME LARGE AMOUNTS OF BACTERIA AND SOLIDS AND THEREFORE ARE GENERALLY HELPFUL IN TREATMENT. THEY ALSO BREAK UP BIOLOGICAL MASSES AND EXPOSE NEW AREAS TO OXYGEN. THE ROTIFERS AID IN KEEPING AN ACTIVELY GROWING BACTERIAL POPULATION BY CONSUMING BACTERIA AND THEREBY ENCOURAGING REPLACEMENT GROWTH. BY CONSUMING UNFLOCCULATED BACTERIA, THE ROTIFERS CONTRIBUTE TO CLEARER EFFLUENCE. THEIR SECRETION CAN ALSO CONTRIBUTE TO FLOCCULATION OF SUSPENDED MATERIALS. THE BDELLOID ROTIFERS DOMINATE AS PROCESS STABILITY IS APPROACHED. (DIFILIPPO-TEXAS)

TITLE MICROSCOPIC ANALYSIS OF PLANKTON, PERIPHYTON, AND ACTIVATED SLUDGE. TRAINING MANUAL.
PUB DATE JUN 76
DESC BIOLOGICAL SCIENCES; CHEMISTRY; ENVIRONMENT; *INSTRUCTIONAL MATERIALS; LABORATORY PROCEDURES, *MANUALS, *MICROBIOLOGY, POST SECONDARY EDUCATION, SCIENCE EDUCATION, *WASTE DISPOSAL, WATER POLLUTION CONTROL, *WATER RESOURCES, *ACTIVATED SLUDGE, *WASTEWATER TREATMENT

ERIC NO. ED161715
DESC NOTE 342P.; CONTAINS OCCASIONAL LIGHT AND SMALL TYPE
ISSUE RIEMAR79
ABSTRACT THIS MANUAL IS INTENDED FOR PROFESSIONAL PERSONNEL IN THE FIELDS OF WATER POLLUTION CONTROL, LIMNOLOGY, WATER SUPPLY AND WASTE TREATMENT, PRIMARY EMPHASIS IS GIVEN TO PRACTICE IN THE IDENTIFICATION AND ENUMERATION OF MICROSCOPIC ORGANISMS WHICH MAY BE ENCOUNTERED IN WATER AND ACTIVATED SLUDGE. METHODS FOR THE CHEMICAL AND INSTRUMENTAL EVALUATION OF PLANKTON ARE COMPARED WITH THE RESULTS OF MICROSCOPIC EXAMINATION IN AN EXTENSIVE PRACTICAL EXERCISE. PROBLEMS OF SIGNIFICANCE AND CONTROL ARE ALSO CONSIDERED. (AUTHOR/BB)

TITLE OPERATION OF WASTEWATER TREATMENT PLANTS: A HOME STUDY TRAINING PROGRAM.
AUTHOR KERRI, K., ED.
PUB DATE 70
AVAIL DEPARTMENT OF CIVIL ENGINEERING, CALIFORNIA STATE UNIVERSITY AT SACRAMENTO, 6000 JAY STREET, SACRAMENTO, CA 95819
DESC ACTIVATED SLUDGE, CHLORINATION, *INSTRUCTIONAL MATERIALS, MAINTENANCE, *MANUALS, *OPERATIONS (WASTEWATER), PRIMARY TREATMENT, *POST SECONDARY EDUCATION, PUMPS, SAFETY, SEDIMENTATION, SLUDGE TREATMENT, STABILIZATION LAGOONS, TRICKLING FILTERS, *WASTE DISPOSAL, *WASTEWATER TREATMENT
DESC NOTE 1317P. REVISED ANNUALLY; ALSO AVAILABLE ON ERIC MICROFICHE ED150008.
ABSTRACT WRITTEN BY EXPERIENCED OPERATORS WITH THE INTENT OF PROVIDING OPERATORS WITH THE INFORMATION THEY NEED TO KNOW TO OPERATE THEIR PLANTS AS EFFICIENTLY AS POSSIBLE. OPERATORS, PERSONS INTERESTED IN BECOMING OPERATORS, AND PERSONS INTERESTED IN THE OPERATION OF TREATMENT PLANTS WILL FIND VALUABLE INFO IN THE MANUAL. TOPICS COVERED INCLUDE DESCRIPTION OF PLANTS, RACKS, SCREENS, COMMINUTORS, GRIT REMOVAL, SEDIMENTATION, TRICKLING FILTERS, ACTIVATED SLUDGE, SLUDGE DISGESTION AND HANDLING, PONDS, CHLORINATION, MAINTENANCE, SAFETY, MATH, LAB, RECORD.

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS: APPENDIX.
AUTHOR WEST, ALFRED W.
PUB DATE MAR 74

DESC *ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, *JOB SKILLS, LABORATORY TRAINING, MANAGEMENT, *MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, ACTIVATED SLUDGE, *WASTEWATER TREATMENT, WATER QUALITY

ERIC NO. ED156472

EDRS PRICE EDRS PRICE MF-$0.83 HC-$2.06 PLUS POSTAGE.

DESC NOTE 37P., FOR RELATED DOCUMENTS, SEE SE 024 421-423; GRAPHS AND CHARTS MAY NOT REPRODUCE WELL

ISSUE RIENOV78

ABSTRACT THIS DOCUMENT IS THE APPENDIX FOR A SERIES OF DOCUMENTS DEVELOPED BY THE NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER DESCRIBING OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS USED IN WASTEWATER TREATMENT. CATEGORIES DISCUSSED INCLUDE: CONTROL TEST DATA, TREND CHARTS, MOVING AVERAGES, SEMI-LOGARITHMIC PLOTS, PROBABILITY PLOT EXAMPLES, TESTING EQUIPMENT AND SYMBOLS AND TERMINOLOGY. (CS)

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS, PART I - OBSERVATIONS, PART II - CONTROL TESTS.

AUTHOR WEST, ALFRED W.

PUB DATE: MAY 74

DESC *ENVIRONMENT, *INSTRUCTIONAL MATERIALS, *JOB SKILLS, LABORATORY TRAINING, MANAGEMENT, MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, ACTIVATED SLUDGE, *WASTEWATER TREATMENT, WATER QUALITY

ERIC NO. ED156469

EDRS PRICE EDRS PRICE MF-$0.83 HC-$2.06 PLUS POSTAGE.

DESC NOTE 31P.; FOR RELATED DOCUMENTS, SEE SE 024 422-424; CONTAINS OCCASIONAL LIGHT TYPE; PHOTOGRAPHS MAY NOT REPRODUCE WELL.

ISSUE RIENOV78

ABSTRACT THIS IS THE FIRST IN A SERIES OF DOCUMENTS DEVELOPED BY THE NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER DESCRIBING OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS USED IN WASTEWATER TREATMENT. PART I OF THIS DOCUMENT DEALS WITH PHYSICAL OBSERVATIONS WHICH SHOULD BE PERFORMED DURING EACH ROUTINE CONTROL TEST. PART II DISCUSSES THE CONTROL TESTS THAT ARE USED TO DIRECTLY IDENTIFY PROCESS PERFORMANCE AND TO DICTATE PROCESS CONTROL ADJUSTMENTS. INCLUDED ARE

CENTRIFUGE TESTS, EFFLUENT TURBIDITY TESTS AND DISSOLVED OXYGEN TESTS. (CS)

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS, PART III-A: CALCULATION PROCEDURES.
AUTHOR WEST, ALFRED W.
PUB DATE DEC 73
DESC *CALCULATION, ENVIRONMENT, *INSTRUCTIONAL MATERIALS, *JOB SKILLS, LABORATORY TRAINING, MANAGEMENT, MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, *WASTEWATER TREATMENT, WATER QUALITY
ERIC NO. ED156470
EDRS PRICE EDRS PRICE MF-$0.83 HC-$3.50 PLUS POSTAGE.
DESC NOTE 56P.; FOR RELATED DOCUMENTS, SEE SE 024 421-424
ISSUE RIENOV78
ABSTRACT THIS IS THE SECOND IN A SERIES OF DOCUMENTS DEVELOPED BY THE NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER DESCRIBING OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS USED IN WASTEWATER TREATMENT. THIS DOCUMENT DEALS EXCLUSIVELY WITH THE CALCULATION PROCEDURES, INCLUDING SIMPLIFIED MIXING FORMULAS, AERATION TANK CHARACTERISTICS, ORGANIC LOADING AND PURIFICATION PRESSURES, CLARIFIER SLUDGE FLOW DEMAND, AND MIXING FORMULA DEVELOPMENT. (CS)

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS, PART III-B: CALCULATION PROCEDURES FOR STEP-FEED PROCESS RESPONSES AND ADDENDUM NO. 1.
AUTHOR WEST, ALFRED W.
PUB DATE FEB 75
DESC *CALCULATION, ENVIRONMENT, *INSTRUCTIONAL MATERIALS, *JOB SKILLS, LABORATORY TECHNIQUES, MANAGEMENT, MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, *WASTEWATER TREATMENT, WATER QUALITY
ERIC NO. ED156471
EDRS PRICE EDRS PRICE MF-$0.83 HC-$2.06 PLUS POSTAGE.
DESC NOTE 44P., FOR RELATED DOCUMENTS, SEE SE 024 421-424
ISSUE RIENOV78
ABSTRACT THIS IS THE THIRD IN A SERIES OF DOCUMENTS DEVELOPED BY THE NATIONAL TRAINING AND OPERATIONAL TECHNOLOGY CENTER DESCRIBING OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS USED

IN WASTEWATER TREATMENT. THIS DOCUMENT DEALS WITH THE CALCULATION PROCEDURES ASSOCIATED WITH A STEP FEED PROCESS. ILLUSTRATIONS AND EXAMPLES ARE INCLUDED TO EMPHASIZE HOW THE ACTIVATED SLUDGE PROCESS REACTS TO CHANGES IN WASTEWATER FEED-POINT LOCATIONS. THE SUMMARY ILLUSTRATES THE TYPES OF CHANGES THAT OCCUR WHEN A PLUG-FLOW SYSTEM IS SWITCHED TO VARIOUS STEP-FEED COMBINATIONS. (CS)

TITLE OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS - PART I (XT-40).
AUTHOR WEST, A. W.
PUB DATE 71
DESC *AUDIOVISUAL AIDS, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, POLLUTION, *POST SECONDARY EDUCATION, WATER POLLUTION CONTROL, *SLUDGE, *SOLID WASTES, WASTEWATER TREATMENT, *ACTIVATED SLUDGE
DESC NOTE INCLUDED IS A 16 MINUTE TAPE, 51 SLIDES, ALSO A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W ST. CLAIR, CINCINNATI, OHIO 45268
ABSTRACT THIS MODULE IS DESIGNED FOR WASTEWATER WORKS OPERATORS WHO WISH TO UPGRADE PLANT PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. THIS IS PART ONE OF A THREE-PART LESSON SERIES ON OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS. ENTITLED "OBSERVATIONS," THIS FIRST PART IS CONCERNED WITH THE ACCURATE READING OF METERS AND WITH THE VISUAL OBSERVATIONS TO BE MADE BOTH AT THE AERATOR (FOAM CHARACTERISTICS, SLUDGE, COLOR, AND ODOR) AND AT THE FINAL CLARIFIERS (CLARITY, EVIDENCES OF BULKING AND OF SEPTIC SOLIDS). PROVISIONAL INTERPRETATIONS TO BE MADE OF THESE VISUAL OBSERVATIONS ARE PRESENTED, AND THE EFFECTIVE USE OF A SLUDGE BLANKET FINDER IS DISCUSSED IN DETAIL. (AUTHOR/JK)

TITLE OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS - PART II (XT-41).
AUTHOR WEST, A. W.
PUB DATE 71
DESC *AUDIOVISUAL AIDS, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, POLLUTION, *POST SECONDARY EDUCATION, *SOLID WASTES, WATER POLLUTION CONTROL, *SLUDGE, WASTEWATER TREATMENT, *ACTIVATED SLUDGE
DESC NOTE INCLUDED IS A 17 MINUTE TAPE, 47 SLIDES AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W ST, CLAIR, CICINNATI, OHIO 45268

PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. THIS IS PART TWO OF A THREE-PART LESSON SERIES ON OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS. THIS PART IS A DETAILED DISCUSSION OF THE PREFERRED TECHNIQUES INVOLVED IN CONDUCTING SETTLOMETER TESTS TO DETERMINE SETTLING CHARACTERISTICS AND IN CENTRIFUGING SAMPLES TO DETERMINE THE CONCENTRATION OF MIXED LIQUOR AND RETURN SLUDGE. HANDLING THE RELATED SAMPLES IS INCLUDED ALONG WITH PROVISIONAL INTERPRETATIONS AND APPLICATIONS OF THE TESTS. (AUTHOR/JK)

TITLE OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS - PART III (XT-42).

AUTHOR WEST, A. W.

PUB DATE 71

DESC *AUDIOVISUAL AIDS, *INSTRUCTIONAL MATERIALS, *LABORATORY PROCEDURES, POLLUTION, *POST SECONDARY EDUCATION, *SOLID WASTES, WATER POLLUTION CONTROL, *SLUDGE, WASTEWATER TREATMENT, *ACTIVATED SLUDGE

DESC NOTE INCLUDED IS A 22 MINUTE TAPE, 67 SLIDES, AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W. ST. CLAIR, CINCINNATI, OHIO 45268

ABSTRACT THIS MODULE IS DESIGNED FOR EXPERIENCED WASTEWATER WORKS OPERATORS WHO WISH TO UPGRADE PLANT PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. THIS IS PART THREE OF A THREE-PART LESSON SERIES ON OPERATIONAL CONTROL TESTS FOR THE ACTIVATED SLUDGE PROCESS. THIS CONCLUDING PART PRESENTS DEVELOPMENT OF SETTLING AND CONCENTRATION CURVES FROM SETTLOMETER AND CENTRIFUGE TESTS RESULTS, TECHNIQUES FOR CONDUCTING TURBIDITY TESTS AS WELL AS THE SIGNIFICANCE OF TURBIDITY RESULTS, A SUMMARY OF ALL THE TESTS PRESENTED IN THE THREE-PART SERIES, THE CONTROL ADJUSTMENTS WHICH ARE MADE ON THE BASIS OF THESE TEST RESULTS, AND PROGRESSIVE TREND CHARTS OF PROCESS CHARACTERISTICS. (AUTHOR/JK)

TITLE OXYGEN ACTIVATED SLUDGE CONSIDERATIONS FOR INDUSTRIAL APPLICATIONS.

AUTHOR ADAMS, C. E., JR.; ECKENFELDER, W. W., JR.; KOON, J. H.; SHELBY, S. E.

CORP AUTH AWARE, INC., NASHVILLE, TN.

PUB DESC AVAILABLE FROM COPYRIGHT CENTER, INC., NEW YORK, NY AS 0065-8812-78-9754-0178 ($0.95). IN: WATER--1977, AICHE SYMPOSIUM SERIES, VOL 74, NO 178, EDITED BY G. F. BENNETT, P 93-101, 1978, 9 FIG, 6 REF.

156

KEYWORDS *ACTIVATED SLUDGE, *WASTE WATER TREATMENT, *INDUSTRIAL WASTE, *OXYGENATION, *BIOLOGICAL TREATMENT, *EVALUATION, WASTE TREATMENT, AERATION, HYDROGEN ION CONCENTRATION, ORGANIC COMPOUNDS, SLUDGE, SUSPENDED SOLIDS, ECONOMICS, COSTS, APPRAISALS, INSTALLATION COSTS, OPERATING COSTS, ODOR.

ABSTRACT A NUMBER OF FACTORS ARE DISCUSSED WHICH MUST BE EVALUATED WHEN ASSESSING THE RELATIVE MERITS OF AIR OXYGENTED VERSUS PURE OXYGEN OXYGENATED ACTIVATED SLUDGE SYSTEMS FOR INDUSTRIAL USE. ORGANIC REMOVAL KINETICS MAY PLAY A MORE IMPORTANT ROLE IN TREATING INDUSTRIAL WASTES THAN MUNICIPAL WASTES BECAUSE OF THEIR HIGH STRENGTH. IT IS SHOWN THAT A HIGHER DISSOLVED OXYGEN LEVEL IN THE AERATION BASIN WILL RESULT IN A HIGHER RESISTANCE TO ORGANIC SHOCK LOADINGS AND A MORE AEROBIC FLOC. A HIGHER TEMPERATURE BECAUSE OF THE ENCLOSURE OF THE AERATION BASIN IS AN ADVANTAGE OF THE PURE OXYGEN SYSTEM, ESPECIALLY IN COLD CLIMATES. EQUILIBIRUM OF THE AERATION BASIN PH CAN BE A PROBLEM WITH THE PURE OXYGEN SYSTEM BECAUSE IT INTAILS A SLIGHTLY LOWER PH. WITH HIGHLY ACIDIC INDUSTRIAL WASTE WATERS IT MAY BE DIFFICULT TO MAINTAIN PH TO AN ACCEPTABLE RANGE BETWEEN 6.5 AND 7.5. ALSO, THE ENCLOSED OXYGEN SYSTEM MAY RESULT IN DIFFICULTIES BY RETAINING VOLATILE ORGANICS WHICH CAN INHIBIT THE SYSTEM. PURE OXYGEN SYSTEMS ARE PREFERABLE TO AIR OXYGEN SYSTEMS FOR CONTROL OF ODORS AND SUSCEPTIBILITY TO SHOCK LOADINGS. ANOTHER FACTOR TO BE CONSIDERED IS MIXED LIQUOR VOLATILE SUSPENDED SOLIDS CONCENTRATIONS WHICH CAN BE HANDLED EFFECTIVELY BY BOTH SYSTEMS IF THEY ARE PROPERLY DESIGNED; HOWEVER, THE PURE OXYGEN SYSTEM DOES HAVE THE ADVANTAGE OF BEING ABLE TO SUPPLY SUFFICIENT OXYGEN TO MAINTAIN RELATIVELY HIGH MIXED LIQUOR OR SOLIDS LEVELS WITHOUT REQUIRING USE OF HIGH POWER LEVELS WHICH WOULD PROMOTE BREAK-UP OF FLOC PARTICLES. ECONOMICALLY, A PURE OXYGEN SYSTEM COSTS MORE TO CONSTRUCT BUT MAY OFFER SUBSTANTIAL SAVINGS IN OPERATING COSTS, BASED MOSTLY ON THE POWER REQUIREMENTS TO ACHIEVE THE NECESSARY DISSOLVED OXYGEN CONCENTRATION. (SEE ALSO W79-00342) (MAJTENYI-IPA)

TITLE PERFORMANCE OF CIRCULAR FINAL CLARIFIERS AT AN ACTIVATED SLUDGE PLANT

AUTHOR MUNCH, W. L.; FITZPATRICK, J. A.
CORP AUTH METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

PUB DESC JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 50, NO 2, P 265-276, FEBRUARY, 1978. 10 FIG, 2 TAB, 10 REF.

KEYWORDS *ACTIVATED SLUDGE, *SETTLING BASINS, *HYDRAULIC MODELS, *SOLID WASTES, *SEPARATION TECHNIQUES, SUSPENDED SOLIDS, HYDRAULICS, EFFLUENT STREAMS, PERFORMANCE, WASTE WATER TREATMENT, MUNICIPAL WASTES.

ABSTRACT THE PERFORMANCE OF A 38 M-DIAM CIRCULAR CENTER-FEED CLARIFIER WAS EVALUATED UNDER VARYING CONDITIONS OF HYDRAULIC AND SOLIDS LOADING AT AN ACTIVATED SLUDGE TREATMENT FACILITY IN CHICAGO, ILLINOIS. LIMITING THE EFFLUENT FLOW TO 0.66 CU M/SEC WITH A 30% RETURN RATE ALLOWED A MAXIMUM SOLIDS LOADING RATE FOR EFFICIENT CLARIFICATION OF 146 KG/SQ M/DAY AT A MIXED LIQUOR CONCENTRATION OF 2,500 MG/LITER. HIGHER FLOW RATES WERE POSSIBLE WHEN THE MIXED LIQUOR CONTENT WAS DECREASED. A HIGHER SOLIDS LOADING RATE WAS ACCOMMODATED BY THE CLARIFIER WHEN THE HYDRAULIC LOADING RATE WAS MAINTAINED BELOW 0.83 CU M/SEC, VERIFYING THE DEPENDENCE OF SOLIDS LOADING ON HYDRAULIC LOAD. AN INCREASE IN THE THICKNESS OF THE SLUDGE BLANKET, OCCURRING AT HYDRAULIC LOADING IN EXCESS OF 0.83 CU M/SEC AT A 30% RETURN, THREATENED THE SOLIDS SEPARATION EFFICIENCY OF THE CLARIFIER. SLUDGE BLANKET LEVEL, SOLIDS SETTLEABILITY, AND HYDRAULIC LOADING REPORTEDLY HAD A GREATER IMPACT ON CLARIFIER SOLIDS SEPARATION PERFORMANCE THAN SHOCK HYDRAULIC LOADING. THE ACTUAL MAXIMUM SOLIDS LOADING RATE WAS SIGNIFICANTLY LOWER THAN THE THEORETICAL MAXIMUM. (LISK-FIRL)

TITLE PRIMARY TREATMENT AND SLUDGE DIGESTION WORKSHOP.

PUB DATE SEP 77

AVAIL PUBLICATIONS CENTRE, ONTARIO MINISTRY OF GOVERNMENT SERVICES, 880 BAY ST., 5TH FLOOR, TORONTO, ONTARIO, CANADA M7A 1N8 ($2.00; ORDERS MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER PAYABLE TO "THE TREASURER OF ONTARIO")

DESC *BEHAVIORAL OBJECTIVES; *ENVIRONMENTAL EDUCATION; ENVIRONMENTAL TECHNICIANS, EQUIPMENT, JOB SKILLS, *POLLUTION, SAMPLING, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *WORKSHOPS, ONTARIO, *SLUDGE, *WASTEWATER TREATMENT

ERIC NO. ED155002

EDRS PRICE EDRS PRICE MF-$0.83 PLUS POSTAGE. HC NOT AVAILABLE FROM EDRS.

DESC NOTE : 269P; FOR RELATED DOCUMENTS, SEE SE 024 226-233, NOT AVAILABLE IN HARD COPY DUE TO COPYRIGHT RESTRICTIONS; CONTAINS COLORED PAGES WHICH MAY NOT NOT REPRODUCE WELL

ISSUE RIEOCT78

ABSTRACT THIS MANUAL WAS DEVELOPED FOR USE AT WORKSHOPS DESIGNED TO UPGRADE THE KNOWLEDGE OF EXPERIENCED WASTEWATER TREATMENT PLANT OPERATORS. EACH OF THE SIXTEEN LESSONS HAS CLEARLY STATED BEHAVIORAL OBJECTIVES TO TELL THE TRAINEE WHAT HE SHOULD KNOW OR DO AFTER COMPLETING THAT TOPIC. AREAS COVERED IN THIS MANUAL INCLUDE: SEWAGE CHARACTERISTICS; COLLECTION, TREATMENT, AND SEDIMENTATION; AEROBIC AND ANAEROBIC DIGESTION; SAMPLING AND INTERPRETATION; MONITORING AND CONTROL; AND SELECTED TESTS. (CS)

TITLE PROCESS CONTROL BY OXYGEN-UPTAKE AND SOLIDS ANALYSIS.

AUTHOR BENEFIELD, L. D.; RANDALL, C. W.; KING, P. H.

CORP AUTH MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF CIVIL ENGINEERING.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 47, NO 10, P 2498-2503, OCTOBER, 1975. 2 FIG, 6 REF.

IDEN PROCESS CONTROL, *OXYGEN-UPTAKE, *SOLIDS ANALYSIS, CLARIFIERS, SLUDGE AGE, SLUDGE WASTING, SUBSTRATE CONCENTRATION.

KEYWORDS OXYGEN, *SOLIDS CONTACT PROCESSES, WASTE WATER TREATMENT, *ACTIVATED SLUDGE, ANALYSIS, SLUDGE TREATMENT, MICROORGANISM, MATHEMATICS, CONTROL SYSTEMS.

ABSTRACT THE MOST COMMON METHODS USED BY PLANT OPERATORS TO CONTROL THE ACTIVATED SLUDGE PROCESS ARE DISCUSSED. THE THEORETICAL BASIS FOR ANOTHER METHOD HAVING CERTAIN ADVANTAGES OVER THE OTHERS WAS STUDIED. FOUR CONTROL METHODS IN COMMON USE ARE: SLUDGE WASTING TO MAINTAIN A CONSTANT MASS OF ORGANISMS IN THE SYSTEM; SLUDGE WASTING TO MAINTAIN A CONSTANT SPECIFIC RATE OF SUBSTRATE UTILIZATION; SLUDGE WASTING TO MAINTAIN A CONSTANT SLUDGE AGE; AND HYDRAULIC CONTROL TO MAINTAIN A CONSTANT SLUDGE AGE. THE LAST TWO, IN WHICH THE SLUDGE AGE IS KEPT CONSTANT, ARE THE MOST FAVORABLE ONES. THE MAJOR WEAKNESS IN THESE METHODS IS THE CONTINUAL SHIFTING IN THE SOLIDS BALANCE BETWEEN THE AERATION TANK AND THE CLARIFIER AS THE INFLUENT FLOW RATE DEVIATES. A NEW METHOD IS PROPOSED IN WHICH THE SOLIDS

SEPARATE AT A RATE SUCH THAT THE SOLIDS CONCENTRATION IS MAINTAINED IN THE SLUDGE RETURN LINES AND NO MICROBIAL GROWTH OCCURS IN THE SECONDARY CLARIFIER. ADVANTAGES OF THIS METHOD INCLUDE: THE EFFECT OF THE FLUCTUATING SOLIDS LEVEL IN THE SECONDARY CLARIFIER IS MINIMIZED; ANY CHANGE IN THE INFLUENT SUBSTRATE CONCENTRATION WILL BE REFLECTED IMMEDIATELY IN THE OXYGEN UPTAKE RATE; AND LOADING FLUCTUATIONS CAN BE COMPENSATED FOR BY VARYING THE INTERVAL BETWEEN CONTROL PERIODS. DISADVANTAGES OF THIS METHOD INCLUDE: THE REQUIREMENT FOR A LABORATORY STUDY TO DETERMINE CHANGES IN THE CONSTANTS; MORE OPERATOR ATTENTION THAN IS REQUIRED IN THE HYDRAULIC METHOD FOR CONTROLLING SLUDGE AGE; AND MATHEMATICAL MANIPULATIONS ARE REQUIRED THAN IN ANY OTHER OF THE METHODS. (PINTO-FIRL)

TITLE PROCESS CONTROL DEMANDS - PART A (XT-60)
WEST, A.
PUB DATE NOV 72
DESC *AUDIOVISUAL AIDS; *INSTRUCTIONAL MATERIALS; POLLUTION; *POST SECONDARY EDUCATION; SLIDES; WASTES; *WATER POLLUTION CONTROL, *ACTIVATED SLUDGE, *OPERATIONS (WASTEWATER)
DESC NOTE INCLUDED IS A 10 MINUTE TAPE, 19 SLIDES, AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W. ST. CLAIR, CINCINNATI, OHIO 45268
ABSTRACT THIS MODULE IS DESIGNED FOR EXPERIENCED WASTEWATER WORKS OPERATORS WHO DESIRE TO UPGRADE PLANT PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. PROVIDED IS AN INTRODUCTION TO A SERIES ON OPERATIONAL CONTROL OF AN ACTIVATED SLUDGE PROCESS. A PLANT SCHEMATIC IS USED TO PRESENT THE EFFECTS OF RETURN SLUDGE FLOW ADJUSTMENTS ON SLUDGE CONCENTRATIONS, SLUDGE DETENTION TIMES, PROCESS EQUILIBRIUM, SLUDGE CHARACTERISTICS, AND FINAL EFFLUENT QUALITY. (AUTHOR/JK)

TITLE PROCESS CONTROL DEMANDS - PART B (XT-61).
WEST, A.
PUB DATE NOV 72
DESC *AUDIOVISUAL AIDS, *INSTRUCTIONAL MATERIALS, POLLUTION, *POST SECONDARY EDUCATION, *TECHNICAL EDUCATION, *WATER POLLUTION CONTROL, *PLANT OPERATIONS, *WASTEWATER TREATMENT, SLUDGE, *ACTIVATED SLUDGE

160

DESC NOTE INCLUDED IS A 15 MINUTE TAPE AND A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W. ST. CLAIR, CINCINNATI, OHIO 45268

ABSTRACT THIS MODULE IS DESIGNED FOR EXPERIENCED WASTEWATER WORKS OPERATORS WHO WISH TO UPGRADE PLANT PERFORMANCE AND TO INCREASE THEIR OWN KNOWLEDGE AND SKILLS. ONE OF A SERIES, THIS MODULE PRESENTS THE DERIVATION OF MIXING FORMULA THAT WILL BE USED IN SUBSEQUENT SECTIONS TO DEVELOP THE RETURN SLUDGE FLOW DEMAND FORMULA USED IN OPERATIONAL CONTROL OF AN ACTIVATED SLUDGE PROCESS. A SCHEMATIC IS USED TO ILLUSTRATE COMPONENTS OF THE FORMULA AND TO DEVELOP A FINAL MASS BALANCE RATIO OF RETURN SLUDGE CONCENTRATION TO MIXED LIQUOR CONCENTRATION IN TERMS OF CLARIFIER SLUDGE PERCENTAGE. SIMPLE MIXING FORMULAE ARE THEN DERIVED FOR EACH OF THE THREE FACTORS ALONG WITH EXAMPLE CALCULATIONS. (AUTHOR/JK)

TITLE PROCESS DESIGN MANUAL: WASTEWATER TREATMENT FACILITIES FOR SEWERED SMALL COMMUNITIES.

AUTHOR LEFFEL, R. E.; AND OTHERS

PUB DATE OCT 77

DESC *ENGINEERING, ENVIRONMENT, *INSTRUCTIONAL MATERIALS, *MANUALS, POLLUTION, *POST SECONDARY EDUCATION, SCIENCE EDUCATION, TECHNICAL REPORTS, *UTILITIES, *WASTE DISPOSAL, WATER POLLUTION CONTROL, WATER RESOURCES, *WASTEWATER TREATMENT, *OPERATIONS (WASTEWATER), RURAL AREAS

ERIC NO. ED162869

EDRS PRICE EDRS PRICE MF-$1.00 HC-$26.11 PLUS POSTAGE.

DESC NOTE 496P.; FOR RELATED DOCUMENTS, SEE SE 025 368-370

ISSUE RIEAPR79

ABSTRACT THIS MANUAL ATTEMPTS TO DESCRIBE NEW TREATMENT METHODS, AND DISCUSS THE APPLICATION OF NEW TECHNIQUES FOR MORE EFFECTIVELY REMOVING A BROAD SPECTRUM OF CONTAMINANTS FROM WASTEWATER. TOPICS COVERED INCLUDE: FUNDAMENTAL DESIGN CONSIDERATIONS, FLOW EQUALIZATION, HEADWORKS COMPONENTS, CLARIFICATION OF RAW WASTEWATER, ACTIVATED SLUDGE, PACKAGE PLANTS, FIXED GROWTH SYSTEMS, WASTEWATER TREATMENT PONDS, FILTRATION AND MICROSCREENING, PHYSICAL-CHEMICAL TREATMENT, NUTRIENT REMOVAL, SLUDGE AND PROCESS SIDESTREAM HANDLING, DISINFECTION AND POSTAERATION, OPERATION AND MAINTENANCE, AND COST EFFECTIVENESS. A GLOSSARY IS ALSO INCLUDED. (AUTHOR/BB)

INSTITUTION NAME CAMP, DRESSLER & MCKEE, INC., BOSTON, MASS.

TITLE ROLE OF ACTIVATED SLUDGE FINAL SETTLING TANKS.

AUTHOR DICK, RICHARD I.

CORP AUTH ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.

AVAIL JOURNAL OF THE SANITARY ENGINEERING DIVISION, ASCE, VOL 96, NO SA2, P 423-436, APRIL 1970. 10 FIG, 17 REF.

IDEN *THICKENING, *FINAL SETTLING TANK, *FLUX RATE, CLARIFICATION, SUSPENDED SOLIDS.

KEYWORDS *ACTIVATED SLUDGE, SEWAGE TREATMENT, SEDIMENTATION, *WASTE WATER TREATMENT.

ABSTRACT THE FINAL SETTLING TANK IN THE ACTIVATED SLUDGE PROCESS HAS TWO FUNCTIONS: CLARIFICATION AND THICKENING. CONVENTIONAL DESIGN PROCEDURES HAVE CONSIDERED ONLY THE CLARIFICATION FUNCTION. HOWEVER, INADEQUATE PERFORMANCE OF THICKENING FUNCTIONS PRODUCES ADVERSE EFFECTS, INCLUDING: LOSS OF SUSPENDED SOLIDS TO THE EFFLUENT AND INSUFFICIENT SUSPENDED SOLIDS CONCENTRATION IN THE SLUDGE RECYCLE WHICH LEADS TO LOWER MIXED LIQUOR SUSPENDED SOLIDS CONCENTRATIONS IN THE AERATION TANK. TO ASSURE PROPER PERFORMANCE OF THE FINAL SETTLING TANK THE TANK SHOULD BE SIZED FOR EACH FUNCTION AND THE LARGER SIZE SHOULD GOVERN THE DESIGN. THE AREA REQUIRED FOR THICKENING MUST BE SUFFICIENT SO THAT SOLIDS ARE APPLIED TO THE TANK AT A RATE LESS THAN THE RATE AT WHICH SOLIDS ARE ABLE TO REACH THE BOTTOM OF THE TANK. THE RATE WHICH BIOLOGICAL SOLIDS REACH THE BOTTOM OF THE TANK IS TERMED THE FLUX RATE. CHARACTERISTICALLY, THIS FLUX RATE PASSES THROUGH A MINIMUM FOR SOME CONCENTRATION OF ACTIVATED SLUDGE PRESENT IN THE SETTLING TANK. THIS MINIMUM FLUX RATE ACTS AS A BOTTLENECK AND GOVERNS THE AREA REQUIRED FOR THICKENING. SEVERAL METHODS FOR DETERMINING THE LIMITING CAPACITY ARE GIVEN IN AN ILLUSTRATIVE EXAMPLE. (DIFILIPPO-TEXAS)

TITLE SEWAGE TREATMENT: BASIC PRINCIPLES AND TRENDS.

AUTHOR BOLTON, R. L.; KLEIN, L.

76

AVAIL ANN ARBOR SCIENCE PUBLISHERS, P.O. BOX 1425, ANN ARBOR, MI 48106

DESC CALCULATION, *CHEMICAL ANALYSIS, CHEMISTRY, ENVIRONMENTAL INFLUENCES, *INSTRUCTIONAL MATERIALS, MEASUREMENT TECHNIQUES, POLLUTION, *POST SECONDARY EDUCATION, *PUBLIC HEALTH, *WASTE DISPOSAL, WATER QUALITY, *WATER POLLUTION CONTROL, *OPERATIONS (WASTEWATER), *WASTEWATER TREATMENT

ABSTRACT PROVIDED IS INFORMATION ON THE BASIC PRINCIPLES OF THE PROCESSES OF SEWAGE TREATMENT, ESPECIALLY AS IT RELATES TO THE CHEMISTRY OF SEWAGE TREATMENT. THE TEXT DISCUSSES THE NATURE OF SEWAGE AND CHEMICAL ANALYSIS AND THEN PROCEEDS THROUGH THE TREATMENT PROCESSES TO FINAL DISPOSAL. THE LAST CHAPTERS DEAL WITH CURRENT TRENDS IN THE FIELD OF WATER POLLUTION CONTROL AND WITH CHEMICAL CALCULATIONS. CONVERSION TABLES FOR BRITISH METRIC UNITS ARE INCLUDED IN THE APPENDIX.

TITLE SEWAGE TREATMENT PLANT DEPENDABILITY WITH SPECIAL REFERENCE TO THE ACTIVATED SLUDGE PROCESS.

AUTHOR WEST, A. W.

CORP AUTH NATIONAL FIELD INVESTIGATIONS CENTER - CINCINNATI, OHIO.

AVAIL AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161, AS PB-231 070, $3.25 IN PAPER COPY. $2.25 IN MICROFICHE, MARCH, 1971. 12 P.

KEYWORDS *SEWAGE TREATMENT, *DESIGN CRITERIA, *OPERATION AND MAINTENANCE, FACILITIES, *ACTIVATED SLUDGE, BIOLOGICAL TREATMENT, WATER POLLUTION CONTROL, WATER QUALITY CONTROL, *TREATMENT FACILITIES, *WASTE WATER TREATMENT.

ABSTRACT THIS WORK IS A REFERENCE FOR SEWAGE TREATMENT PLANT DEPENDABILITY LECTURES PRESENTED AT TRAINING SESSIONS, SYMPOSIA, AND WORKSHOPS. DESIGN CONSIDERATIONS NECESSARY TO ACHIEVE CONSISTENTLY SATISFACTORY PLANT PERFORMANCE AND FINAL EFFLUENT QUALITY INCLUDE THE PROPER TREATMENT PROCESSES, A GENEROUS PLANT CAPACITY, ESSENTIAL FLEXIBILITY, AND TRUE CONTROLLABILITY OF THE PLANT. THE TREATMENT PROCESS OR MODIFICATION MOST APPROPRIATE TO THE KNOWN WASTE CHARACTERISTICS AND EFFLUENT QUALITY REQUIREMENTS SHOULD BE CHOSEN. EXAMPLES INCLUDE THE CLASSIC ACTIVATED SLUDGE PROCESS, THE COMPLETE MIX MODIFICATION AND THE STEP AERATION MODIFICATION. PILOT STUDIES ON A BENCH, PILOT, OR DEMONSTRATION SCALE MAY BE PERFORMED TO RESOLVE UNCERTAINITIES ABOUT THE CORRECT PROCESS TO CHOOSE. THE SUGGESTIONS CONTAINED IN DESIGN CRITERIA MANUALS SUCH AS THE "10-STATES STANDARDS" SHOULD BE CONSIDERED AS MINIMUM REQUIREMENTS NEEDED TO PROVIDE ADEQUATE SAFETY FACTORS TO ASSURE PLANT DEPENDABILITY. ITEMS DISCUSSED UNDER FLEXIBILITY OF A PLANT INCLUDE: PROCESS; AERATION TANKS; FINAL CLARIFIERS; RETURN SLUDGE PUMPING FACILITIES; EXCESS SLUDGE WASTING; EMERGENCY

CHEMICAL TREATMENT; SLUDGE HANDLING FACILITIES; EQUALIZING TANKS; AND HOLDING PONDS. THE ACTIVATED SLUDGE SYSTEM IS A CONTROLLABLE PROCESS THAT SHOULD HAVE THE APPROPRIATE METERS AND ACCURATELY CONTROLLABLE GATES, VALVES, PUMPS, AND BLOWERS FOR OPTIMUM PERFORMANCE. QUALIFIED OPERATORS ARE NEEDED TO ACHIEVE THE HIGH QUALITY EFFLUENT THAT CAN BE PRODUCED BY A PROPERLY DESIGNED WASTE TREATMENT PLANT; DEDICATED, EXPERIENCED OPERATORS ARE NEEDED EVEN MORE AT PLANTS WHICH HAVE DESIGN DEFECTS. (ORR-FIRL)

TITLE START-UP MUNICIPAL WASTEWATER TREATMENT FACILITIES.

AUTHOR RADAR, R. D.; GREEN, R. L.; PAGE, G. L., JR.

CORP AUTH WILEY AND WILSON, INC., LYNCHBURG, VA

AVAIL FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402 PRICE $1.40. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC, OFFICE OF WATER PROGRAM OPERATION, REPORT EPA-43019-74-008, DECEMBER 1973. 92P, 3 FIG, 2 TAB, 42 REF. EPA CONTRACT 68-01-0341.

IDEN PROCEDURES, PROCESS, SEED SLUDGE, STAFFING, STANDARD OPERATING PROCEDURES, SITE MEETINGS, INVENTORY INSPECTION PRETESTING, OPERATOR TRAINING, SETTLEABLE SOLIDS, TOTAL SOLIDS, VOLATILE SOLIDS, VOLATILE ACIDS, MIXED LIQUOR SUSPENDED SOLIDS.

KEYWORDS *ADMINISTRATIVE DECISIONS, *TREATMENT FACILITIES, *WASTE WATER TREATMENT, *OPERATIONS, *LABORATORY TESTS, *SAMPLING, TESTING, ANALYSIS, CONTROLS, ACTIVATED SLUDGE, TRICKLING FILTER, OXIDATION LAGOONS, ANAEROBIC DIGESTION, SAFETY, CHLORINATION, SUSPENDED SOLIDS, HYDROGEN ION CONCENTRATION, ALKALINITY, BIOCHEMICAL OXYGEN DEMAND, CHEMICAL OXYGEN DEMAND, PRE-TREATMENT (WATER), SEWAGE TREATMENT.

ABSTRACT THIS MANUAL PROVIDES GUIDANCE FOR PUTTING INTO INITIAL OPERATION MUNICIPAL WASTEWATER TREATMENT PLANT, A NEW ADDITION TO AN EXISTING TREATMENT PLANT, OR A CHANGE IN THE MODE OF THE TREATMENT PLANT'S OPERATION SO THAT THE TREATMENT PLANT OR PROCESS WILL EFFECTIVELY TREAT THE WASTEWATER IN COMPLIANCE WITH SPECIFIC CONDITIONS AND LIMITATIONS ESTABLISHED FOR TREATMENT FACILITY. THE MANUAL WAS DEVELOPED AND PREPARED WITH THE AID AND COOPERATION OF WASTEWATER TREATMENT PLANT OPERATORS AND SUPERINTENDENTS, START-UP EXPERTS, THE ACADEMIC COMMUNITY, MANUFACTURERS AND

SUPPLIERS OF WASTEWATER TREATMENT PLANT EQUIPMENT, AND A LITERATURE REVIEW OF WASTEWATER TREATMENT PLANT OPERATIONS AND RECOGNIZED START-UP TECHNIQUES. INFORMATION IS PROVIDED ON PREPARING FOR ACTUAL TREATMENT PLANT START-UP. PREPARATIONS FOR START-UP INCLUDE: STAFFING THE PLANT, DEVELOPING STANDARD OPERATING PROCEDURES, DRY- AND WET-RUN TESTING OF EQUIPMENT, ON-SITE OPERATOR TRAINING, SAFETY, AND ESTABLISHING PROCEDURES WHEN CONSTRUCTION IS CONTINUING DURING START-UP. THIS MANUAL DESCRIBES START-UP PROCEDURES FOR SOME OF THE MORE COMMON PRETREATMENT AND PRIMARY TREATMENT UNITS; FOR THE SPECIFIC SECONDARY TREATMENT PROCESSES OF ACTIVATED SLUDGE, TRICKLING FILTERS, STABILIZATION PONDS AND AERATED LAGOONS; AND FOR THE SLUDGE HANDLING UNITS AND THE ANAEROBIC DIGESTION PROCESS. THE START-UP PROCEDURES FOR ADVANCED WASTEWATER TREATMENT UNITS AND PROCESSES ARE NOT CONSIDERED IN THIS MANUAL. (EPA)

TITLE UPGRADING BIOLOGICAL TREATMENT (XT-25).
AUTHOR WEST, A. W.
PUB DATE AUG 71
DESC *AUDIOVISUAL AIDS, ENGINEERING, *INSTRUCTIONAL MATERIALS, POLLUTION, *POST SECONDARY EDUCATION, *WATER POLLUTION CONTROL, *PLANT OPERATIONS, *WASTEWATER TREATMENT, *BIOLOGICAL TREATMENT
DESC NOTE INCLUDED IS A 28 MINUTE TAPE AND 63 SLIDES, ALSO A SCRIPT. AVAILABLE ON LOAN FROM NTOTC, 26 W. ST. CLAIR, CINCINNATI, OHIO 45268
ABSTRACT THIS MODULE IS DESIGNED FOR EXPERIENCED AND SUPERVISORY WASTEWATER WORKS OPERATORS AND MANAGERIAL PERSONNEL, AND SHOULD ALSO BE OF INTEREST TO DESIGN ENGINEERING PERSONNEL. IT DISCUSSES WAYS TO GET MAXIMUM USE OF PRESENT EXISTING SECONDARY TREATMENT PROCESSES BY IMPROVED OPERATIONAL CONTROL OF DESIGN. IT INCLUDES CASE HISTORIES OF HOW THE POLLUTIONAL STRENGTH OF AN ACTIVATED SLUDGE PLANT EFFLUENT WAS REDUCED TO ONE-QUARTER OF ITS FORMER STRENGTH AT ONE LOCATION, AND HOW TRICKLING FILTER PRETREATMENT WITH ACTIVATED SLUDGE POLISHING ACCOMPLISHED 99% REDUCTION FOR A COMBINATION OF DOMESTIC SEWAGE AND STRONG MEAT PACKING WASTES AT ANOTHER. (AUTHOR/JK)

TITLE USE OF HIGH-PURITY OXYGEN IN THE ACTIVATED SLUDGE PROCESS, VOLUME 1.
AUTHOR MCWHIRTER, J. R.

PUB DATE 78
AVAIL CRC PRESS, INC., 2255 PALM BEACH LAKES BLVD., WEST PALM BEACH, FL 33409
DESC ACTIVATED SLUDGE, DEWATERING, *INSTRUCTIONAL MATERIALS, OPERATIONS, *OXYGEN, POST SECONDARY EDUCATION, *SECONDARY TREATMENT, *WASTE DISPOSAL, WASTEWATER SLUDGE, *WASTEWATER TREATMENT
DESC NOTE 250P. CAT. NO. 5101EF32
ABSTRACT CONSTITUTES A COMPREHENSIVE SOURCE OF BACKGROUND AS WELL AS CURRENT-DAY TECHNOLOGY STATUS REGARDING THE USE OF OXYGEN IN SECONDARY WASTEWATER TREATMENT. DIVIDED INTO THREE BASIC PARTS, THE FIRST SECTION CONSISTS OF BACKGROUND AND HISTORICAL INFORMATION, THE SECOND DEALS WITH CURRENT-DAY DESIGN AND APPLICATIONS. THE LAST IS ON PRESENT-DAY EXPERIENCE AND OPERATIONAL INFORMATION FROM OXYGENATION SYSTEMS CURRENTLY IN OPERATION AND UNDER DESIGN.

TITLE USE OF HIGH-PURITY OXYGEN IN THE ACTIVATED SLUDGE PROCESS, VOLUME 2.
AUTHOR MCWHIRTER, J. R.
PUB DATE 78
AVAIL CRC PRESS, INC., 2255 PALM BEACH LAKES BLVD., WEST PALM BEACH, FL 33409
DESC ACTIVATED SLUDGE, DEWATERING, *INSTRUCTIONAL MATERIALS, OPERATIONS, *OXYGEN, POST SECONDARY EDUCATION, *SECONDARY TREATMENT, *WASTE DISPOSAL, WASTEWATER SLUDGE, *WASTEWATER TREATMENT
DESC NOTE 250P. CAT. NO. 5102EF32

TITLE WASTEWATER ENGINEERING: COLLECTION, TREATMENT, DISPOSAL.
PUB DATE 72
DESC MCGRAW-HILL BOOK COMPANY, 1221 AVENUE OF THE AMERICAS, NEW YORK, NY 10020
*DESIGN, *ENGINEERING, *FACILITIES, *INSTRUCTIONAL MATERIALS, *OPERATIONS (WASTEWATER), POST SECONDARY EDUCATION, PUMPS, *SEWERS, SLUDGE, *WASTEWATER TREATMENT, WATER CHARACTERISTICS, *WATER RESOURCES
DESC NOTE 782P. (NO. 041675-3); SOLUTION MANUAL (NO. 041676-1)
ABSTRACT INCLUDES: DEVELOPMENT AND TRENDS IN WASTEWATER ENGINEERING; DETERMINATION OF SEWAGE FLOWRATES; HYDRAULICS OF SEWERS; DESIGN OF SEWERS; PUMPS AND PUMPING STATIONS; WASTEWATER CHARACTERISTICS; PHYSICAL UNIT OPERATIONS; CHEMICAL UNIT PROCESSES; DESIGN OF FACILITIES FOR: PHYSICAL AND CHEMICAL

TREATMENT OF WASTEWATER, FOR BIOLOGICAL TREATMENT, DISPOSAL OF SLUDGE AND MORE.

TITLE WASTEWATER TREATMENT - SERIES C.
AVAIL NEW ENGLAND REGIONAL WASTEWATER INST., 2 FORT ROAD, SOUTH PORTLAND, ME 04106 (FREE RENTAL)
DESC CHEMICAL TREATMENT, DISINFECTION, FILTRATION, *INSTRUCTIONAL MATERIALS, *PRIMARY TREATMENT, POST SECONDARY EDUCATION, SEDIMENTATION, *SECONDARY TREATMENT, *SLIDES, SLUDGE DEWATERING, STABILIZATION LAGOONS, *TERTIARY TREATMENT, VISUAL AIDS, WASTE DISPOSAL, *WASTEWATER TREATMENT
DESC NOTE ORDER SERIES C WITH ACCOMPANYING NARRATIVE: 100 SLIDES.
ABSTRACT FOCUSING ON THE TECHNICAL ASPECTS OF WASTEWATER TREATMENT. IT FEATURES PRIMARY AND SECONDARY FACILITIES AND INCLUDES SEGMENTS ON THE TRAINING OF PLANT OPERATORS AND ON SAFETY.

TITLE WATER AND WASTEWATER TREATMENT: CALCULATIONS FOR CHEMICAL AND PHYSICAL PROCESSES.
AUTHOR HUMENICK, MICHAEL J. JR.
PUB DATE 77
AVAIL MARCEL DEKKER, 270 MADISON AVE., NEW YORK, NY 10016
ABSTRACT THIS BOOK PRESENTS THE INFORMATION NEEDED BY AN ENVIRONMENTAL TECHNICIAN TO PERFORM THE PROCESS CALCULATIONS NECESSARY IN THE OPERATION OF WATER OR WASTEWATER TREATMENT FACILITIES. THE MATERIAL IS ORGANIZED SO AS A PROBLEM IS PRESENTED, THE SOLUTION FOLLOWS IMMEDIATELY. EACH TOPIC AREA HAS NUMEROUS PRACTICE EXAMPLES WITH SOLUTIONS AND ANSWERS. SUBJECT AREAS INCLUDE: COAGULATION AND FLOCCULATION; WATER CONDITIONS, SEDIMENTATION; FILTRATION; ACTIVATED CARBON; ADSORPTION; CHLORINATION AND AERATION. THE APPENDICES CONTAIN INFORMATION REGARDING PHYSICAL AND CHEMICAL PROPERTIES, CONVERSION FACTORS, AND COMPUTER PROGRAMS. (CS)

TITLE WATER AND WASTEWATER TREATMENT, VOL. 4
AUTHOR HUMENICK, MICHAEL J., JR.
PUB DATE 77
DESC *CALCULATION, *CHEMICAL REACTIONS, *DESIGN, ENVIRONMENTAL INFLUENCES, ENGINEERING, *INSTRUCTIONAL MATERIALS, POLLUTION, *POST SECONDARY EDUCATION, PUBLIC HEALTH, WASTE DISPOSAL, *WATER POLLUTION CONTROL, *OPERATIONS (WASTEWATER), *OPERATIONS (WATER), *WASTEWATER

TREATMENT, WATER TREATMENT

DESC NOTE 236P.

ABSTRACT INCLUDED IN THIS VOLUME ARE CALCULATION PROCEDURES WHICH CAN BE UTILIZED IN THE DESIGN OF SUCH PROCESSES AS EQUALIZATION, COAGULATION AND FLOCCULATION, CHEMICAL PRECIPITATION, AND GRAVITY SEDIMENTATION. EXAMPLES OF PROBLEMS RELATED TO FILTRATION, ACTIVATED CARBON ABSORPTION, ION EXCHANGE, CHLORINATION, DISINFECTION, AND AERATION ARE ALSO COVERED. INFORMATION OF PHYSICAL AND CHEMICAL PROPERTIES, CONVERSION FACTORS, AND COMPUTER PROGRAMS ARE DETAILED IN THE APPENDIXES. (CS)

TITLE WPCF WASTEWATER TREATMENT PLANT OPERATOR TRAINING PROGRAM, INTERMEDIATE COURSE: STUDENT WORKBOOK, VOL. 1, PARTS 1 AND 2.

PUB DATE 78

AVAIL WATER POLLUTION CONTROL FEDERATION, 2626 PENNSYLVANIA AVE., WASHINGTON, D.C. 20036

DESC *ACTIVATED SLUDGE, AUDIOVISUAL AIDS, CERTIFICATION, *CLARIFICATION (WASTEWATER), ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *OPERATIONS (WASTEWATER), POLLUTION, *POST SECONDARY EDUCATION, *WASTEWATER COLLECTION, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL.

DESC NOTE 244P. COURSE MATERIALS: 35 MM SLIDES (340), 9 TAPE CASSETTES, ADMINISTRATOR HANDBOOK, CARRYING CASE, AND STUDENT WORKBOOK (PARTS 1 AND 2) - ORDER NO. E0291 $400.00; STUDENT WORKBOOK ONLY - ORDER NO. E0292, $4.50; OTHER VOLUMES; EW003822 AND EW003823

ABSTRACT THIS DOCUMENT IS ONE IN A SERIES OF SELF-INSTRUCTIONAL WORKBOOKS FOR TRAINING WASTEWATER TREATMENT PLANT OPERATIONS IN THE BASIC FUNCTIONS OF FACILITY OPERATION. THE WORKBOOK CONTAINS A PRE- AND POST-TEST QUESTIONNAIRE FOR EACH UNIT AS WELL AS SELF-TESTS AS INTERIM GUIDES. THE UNITS DISCUSSED IN THE VOLUME ARE A GENERAL INTRODUCTION, THE COMMUNITY WASTEWATER SYSTEM, PRE-TREATMENT, CLARIFICATION, AND ACTIVATED

TITLE SLUDGE. (CS)

WPCF WASTEWATER TREATMENT OPERATOR TRAINING PROGRAM, INTERMEDIATE COURSE: STUDENT WORKBOOK, VOL. 8.

PUB DATE 78

AVAIL WATER POLLUTION CONTROL FEDERATION, 26226 PENNSYLVANIA AVE., WASHINGTON, DC 20037

DESC AUDIOVISUAL AIDS, CERTIFICATION, *ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *OPERATIONS (WASTEWATER), POLLUTION, *POST SECONDARY EDUCATION, *SLUDGE, *TRICKLING FILTERS, *WASTE STABILIZATION PONDS, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL.

DESC NOTE 144P. COURSE MATERIALS: 35 MM SLIDES (APPROX. 230), 7 TAPE CASSETTES, ADMINISTRATOR HANDBOOK, CARRYING CASE, AND STUDENT WORKBOOK - ORDER NO. E0293, $300.00; STUDENT WORKBOOK ONLY - ORDER NO. E0294, $3.50; OTHER VOLUMES: EW003821 AND EW003823

ABSTRACT THIS DOCUMENT IS ONE IN A SERIES OF SELF-INSTRUCTIONAL WORKBOOKS FOR TRAINING WASTEWATER TREATMENT PLANT OPERATORS IN THE BASIC FUNCTIONS OF FACILITY OPERATION. THE WORKBOOK CONTAINS A PRE- AND POST-TEST QUESTIONNAIRE FOR EACH UNIT AS WELL AS SELF-TESTS AS INTERIM GUIDES. THE UNITS DISCUSSED IN THIS VOLUME ARE WASTE STABILIZATION PONDS, TRICKLING FILTERS, AND SLUDGE HANDLING AND DIGESTION. (CS)

TITLE WPCF WASTEWATER TREATMENT PLANT OPERATOR TRAINING PROGRAM, INTERMEDIATE COURSE: STUDENT WORKBOOK, VOL. C.

PUB DATE 78

AVAIL WATER POLLUTION CONTROL FEDERATION, 2626 PENNSYLVANIA AVE., WASHINGTON, D.C. 20037

DESC AUDIOVISUAL AIDS, CERTIFICATION, *DISINFECTION, *ENVIRONMENTAL TECHNICIANS, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *OPERATIONS (WASTEWATER), POLLUTION, *POST SECONDARY EDUCATION, *PUMPS, *SAFETY, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL.

DESC NOTE 90P. COURSE MATERIALS: 35 MM SLIDES (APPROX. 270), 7 TAPE CASSETTES, ADMINISTRATOR HANDBOOK, CARRYING CASE, AND STUDENT WORKBOOK - ORDER NO. E0296, $3.50; OTHER VOLUMES: EW003821 AND EW003822

ABSTRACT THIS DOCUMENT IS ONE IN A SERIES OF SELF-INSTRUCTIONAL WORKBOOKS FOR TRAINING WASTEWATER TREATMENT PLANT OPERATORS IN THE BASIC FUNCTIONS OF FACILITY OPERATION. THE WORKBOOK CONTAINS A PRE- AND POST-TEST QUESTIONNAIRE FOR EACH UNIT AS WELL AS SELF-TESTS AS INTERIM GUIDES. THE UNITS DISCUSSED IN THIS VOLUME ARE DISINFECTION, SAFETY, AND PUMPING.

Part IV

Reference Materials
Not Abstracted

TITLE THE ABC WAY TO BETTER WASTEWATER TREATMENT.
AUTHOR KERL, J. F.
CORP AUTH ENVIRONMENTAL QUALITY ENGINEERING, INC., OAKLAND, CALIF.
AVAIL AMERICAN DYESTUFF REPORTER, VOL 62, NO 8, P 24-25, AUGUST 1973. 1 FIG, 1 ILLUS, 2 REF.

TITLE ACTINOMYCETES OF SEWAGE-TREATMENT PLANTS.
AUTHOR LECHEVALIER, H. A.; LECHEVALIER, M. P.; WYSZKOWSKI, P. E.
CORP AUTH RUTGERS - THE STATE UNIV., PISCATAWAY, NJ. WAKSMAN INST. OF MICROBIOLOGY.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-272 589, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-77-145, 1977. 89 P. 6 FIG, 15 TAB, 5 REF.

TITLE ACTINOMYCETES OF SEWAGE-TREATMENT PLANTS.
AUTHOR LECHEVALIER, H. A.
CORP AUTH RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. WAKSMAN INST. OF MICRIBIOLOGY.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161, AS PB-245 914, $4.50 IN PAPER COPY, $3.00 IN MICROFICHE. ENVIRONMENTAL PROTECTION AGENCY, ENVIRONMENTAL PROTECTION TECHNOLOGY STUDIES SERIES NO. EPA-600/2-75-031, SEPTEMBER 1975. 62 P, 23 TAB, 19 REF. R-802003.

TITLE ACTIVATED SLUDGE.
AUTHOR SAUNDERS, F. M.
CORP AUTH GEORGIA INST. OF TECH., ATLANTA.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 6, P 1005-1016, JUNE, 1977. 114 REF.

TITLE ACTIVATED SLUDGE (LITERATURE REVIEW).
AUTHOR SCHROEDER, E. D.
CORP AUTH CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 6, P 1098-1107, JUNE, 1976. 110 REF.

TITLE ACTIVATED SLUDGE (LITERATURE REVIEW).
AUTHOR AZAD, H. S.; BERGMANN, D. E.; STUMPF, M. R.
CORP AUTH WATER POLLUTION CONTROL FEDERATION, WASHINGTON, DC
AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 42, NO 6, P 897-910, JUNE 1970. 105 REF.

TITLE ADDITION OF POWDERED ACTIVATED CARBON TO ACTIVATED SLUDGE REACTORS.
AUTHOR KLEI, H. E.; SUNDSTROM, D. W.
CORP AUTH CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-264 887, IN PAPER COPY, IN MICROFICHE. COMPLETION REPORT, MARCH 1977. 41 P, 2 TAB, 27 FIG, 4 REF, OWRT A-057-CONN(1), 14-31-0001-5007.

TITLE ADVANCED AUTOMATIC CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE TREATMENT PROCESS.
AUTHOR PETERSACK, J. F.; SMITH, R. G.
CORP AUTH SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161. ENVIRONMETNAL PROTECTION AGENCY, REPORT EPA-670/2-75-039. MAY 1975., 154 P, 33 FIG, 11 TAB, 14 REF, 3 APPEND. 1BB043; ROAP 21ASC; TASK 007 R800356.

TITLE AERATION TANK FOR ACTIVATED SLUDGE TREATMENT OF WASTE WATER - IS SMALLER AND REQUIRES LESS POWER FOR A GIVEN TREATMENT CAPACITY.
AVAIL NETHERLANDS PATENT NL 7610-431. ISSUED MARCH 28, 1977. DERWENT NETHERLANDS PATENTS ABSTRACTS, VOL Y, NO 15, P D5, MAY, 1977.

TITLE AIR V. OXYGEN IN DORSET.
AVAIL WATER AND WASTE TREATMENT, VOL 20, NO 1, P 14-15, JANUARY, 1977. 1 FIG, 1 TAB.

TITLE AIR VS 02: TWO ACTIVATED SLUDGE SYSTEMS COMPARED.
AUTHOR MILLER, M. A.
CORP AUTH UNION CARBIDE CORP., TONAWANDA, NY ENVIRONMENTAL SYSTEMS DEPT.
AVAIL WATER AND WASTES ENGINEERING, VOL 15, NO 4, P 58-60, 62-65, APRIL, 1978. 6 FIG, 8 TAB, 17 REF.

TITLE ALBUQUERQUE PLANT DESIGNED WITH COMPUTER IN MIND.
AUTHOR RICOY, J. L.; MATOTAN, W. I.
CORP AUTH WILLIAM MATOTAN AND ASSOCIATES, ALBUQUERQUE, NM
AVAIL WATER AND WASTES ENGINEERING, VOL 13, NO 1, P 32-35, 37, JANUARY, 1976.

TITLE ALUM ADDITION AIDS SLUDGE PROCESS IN PHOSPHORUS REMOVAL.
AVAIL WATER AND WASTES ENGINEERING, VOL 15, NO 3, P 14, MARCH, 1978.

TITLE ALUM ADDITION TO ACTIVATED SLUDGE WITH TERITARY SOLIDS REMOVAL.
AUTHOR HAIS, A. B.; STAMBERG, J. B.; BISHOP, D. F.
CORP AUTH DISTRICT OF COUMBIA DEPT. OF ENVIRONMENTAL SERVICES, WASHINGTON.
AVAL COPY AVAILABLE FROM GPO SUP AS EP1.23:670-73-037, $0.65; MICROFICHE FROM NTIS AS PB-225 028/0, $1.45. ENVIRONMENTAL PROTECTION AGENCY, TECHNOLOGY SERIES REPORT EPA-670/2-73-037, AUGUST 1973, 25 P, 7 FIG, 5 TAB, 8 REF. EPA PROJECT 11010 EYM. CONTRACT 14-12-818.

TITLE ALUM ADDITION AND STEP-FEED STUDIES IN OXYGEN ACTIVATED SLUDGE.
AUTHOR BISHOP, D. F.; HEIDMAN, J. A.; BRENNER, R. C.; STAMBERG, J. B.
CORP AUTH DEPARTMENT OF ENVIRONMENTAL SERVICES, WASHINGTON, DC.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-272 892, IN PAPER COPY, IN MICROFICHE, REPORT EPA-600/2-77/166, 1977. 31 P, 6 FIG, 10 TAB, 10 REF.

TITLE APPLICATION OF MICROBIOLOGY AND BIOENGINEERING PRINCIPLES TO BIOLOGICAL WASTE TREATMENT.
AUTHOR LEVIN, GILBERT V.; COHEN, OBADIAH P.
CORP AUTH BIOSPHERICS INC., ROCKVILLE, MD
AVAIL CHEMICAL ENGINEERING PROGRESS, SYMPOSIUM SERIES, VOL 67, NO 107, P 131-134, 1971. 1 TAB, 44 REF.

TITLE ATP POOLS IN ACTIVATED SLUDGE.
AUTHOR CHIU, S. Y.; KAO, I. C.; ERICKSON, L. E.;
CORP AUTH FAN, L. T. KANSAS STATE UNIV., MANHATTAN. DEPT. OF CHEMICAL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 45, NO 8, P 1746-1758, AUGUST 1973. 18 FIG, 4 TAB, 30 REF. OWRR A-045-KAN(3) 14-31-0001-3516.

TITLE AUTOMATIC DISSOLVED OXYGEN CONTROL.
AUTHOR FLANAGAN, M. J.; BRACKEN, B. D.; ROESLER, J. F.
CORP FLANAGAN AND ASSOCIATES, SAN FRANCISCO, CALIF.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, PROCEEDINGS OF ASCE, VOL 103, NO EE4, P 707-722, DIVISION, PROCEEDINGS OF ASCE, VOL 103, NO EE4, P 707-722, AUGUST 1977. 9 TAB, 5 FIG, 3 REF, 1 APPEND.

TITLE AUTOMATION OF THE CONTROL AND OPERATION OF WATER POLLUTION CONTROL WORKS.
AUTHOR COTTON, P.
CORP AUTH NORWICH SEWAGE TREATMENT WORKS (ENGLAND)
AVAIL WATER POLLUTION CONTROL, VOL 72, NO 8, P 635-657, 1973. 25 REF.

TITLE BIOFLOCCULATION AND THE ACCUMULATION OF CHEMICALS BY FLOC-FORMING ORGANISMS.
AUTHOR DUGAN, P. R.
CORP AUTH OHIO STATE UNIV., COLUMBUS, DEPT. OF MICROBIOLOGY.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-245 793, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-75-032, SEPTEMBER 1975. 148 P, 51 FIG, 21 TAB, 119 REF.

TITLE BIOLOGICAL CONCEPTS FOR DESIGN AND OPERATION OF THE ACTIVATED SLUDGE PROCESS.
AUTHOR GAUDY, F., JR.; GAUDY, T.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER, BIOENVIRONMENTAL ENGINEERING LABS.
AVAIL GPO SUP DOC AS EP 2.10: 17090 FQJ 09/71, $1.25; MICROFICHE FROM NTIS AS PB-211 131, $0.95. ENVIRONMENTAL PROTECTION AGENCY, WATER POLLUTION CONTROL RESEARCH SERIES, SEPTEMBER 1971. 154 P, 36 FIG, 3 TAB, 69 REF. EPA PROGRAM 17090 FQJ 09/71.

TITLE BIOLOGICAL METHODS FOR CONTROL OF NITROGEN IN MUNICIPAL WASTEWATERS.
AUTHOR ROSENKRANZ, W. A.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. OFFICE OF RESEARCH AND DEVELOPMENT.
AVAIL IN: 3RD USA/USSR SYMPOSIUM ON INTENSIFICATION OF BIO-CHEMICAL TREATMENT OF WASTEWATERS, HELD AT VOGEDO HEADQUARTERS, MOSCOW, USSR ON AUGUST 23-24, 1976. P 32-35, 1976. 4 FIG, 2 TAB, 5 REF.

TITLE BIOLOGICAL REGENERATION OF POWERED ACTIVATED CARBON ADDED TO ACTIVATED SLUDGE UNITS.
AUTHOR DEWALLE, F. B.; CHIAN, E. S. K.
CORP AUTH ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.
AVAIL WATER RESEARCH, VOL 11, NO 5, P 439-446, 1977. 9 FIG, 3 TAB, 33 REF.

TITLE BIOLOGICAL TREATMENT PROCESS IN COLD CLIMATES.
AUTHOR BOYLE, J. D.
CORP AUTH CH2M/HILL, CORVALLIS, OREG. WASTEWATER RECLAMATION.
AVAIL WATER AND SEWAGE WORKS, REFERENCE NUMBER, P R-28, R-30, R-32-R-34, R-37-R-38, R-43-R-44, R-46, R-48, R-50, APRIL 30, 1976. 16 FIG, 2 TAB, 9 REF.

TITLE BIOLOGICAL WASTE TREATMENT.
AUTHOR JANK, B. E.
CORP AUTH DEPARTMENT OF THE ENVIORNMENT, OTTAWA (ONTARIO). WASTEWATER TECHNOLOGY CENTRE.
AVAIL IN: PROCEEDINGS OF SEMINARS ON WATER POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY, MAY 1975, OTTAWA, MONCTON, AND PRINCE GEORGE, CANADA, ENVIRONMENTAL PROTECTION SERVICE,

WATER POLLUTION CONTROL DIRECTORATE, ECONOMIC AND TECHNICAL REVIEW REPORT EPS 3-WP-76-4, P 35-80, MARCH, 1976. 14 FIG, 31 REF, 4 TAB.

TITLE BULKING CONTROL MADE EASY - WITH HYDROGEN PEROXIDE.
AUTHOR STRUNK, W. G.; SHAPIRO, J.
CORP AUTH FMC CORP., PRINCETON, NJ.
AVAIL WATER AND POLLUTION CONTROL, VOL 114, NO 7, P 10, 12, 14, 15, 40-41, JULY, 1976.

TITLE CASE HISTORIES: IMPROVED ACTIVATED SLUDGE PLANT PERFORMANCE BY OPERATIONS CONTROL.
AUTHOR WEST, A. W.
CORP AUTH FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, CINCINNATI, OHIO. DIV. OF TECHNICAL SERVICES.
AVAIL PROCEEDINGS, 8TH ANNUAL ENVIRONMENTAL AND WATER RESOURCES ENGINEERING CONFERENCE, JUNE 5-6, 1969, TECHNICAL REPORT NO 20, DEPARTMENT OF ENVIRONMENTAL AND WATER RESOURCES ENGINEERING, VANDERBILT UNIVERSITY, P 161-170, (1969).

TITLE CELL YIELD AND GROWTH RATE IN ACTIVATED SLUDGE.
AUTHOR SHERRARD, J.H.; SCHROEDER, E. D.
CORP AUTH CORNELL UNIV., ITHACA, NY SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 45, NO 9, P 1889-1897, SEPTEMBER 1973. 8 FIG, 2 TAB, 12 REF.

TITLE CHEMICALLY ASSISTED BIOLOGICAL OXIDATION OF WASTES AND EXCESS SLUDGE.
AUTHOR GAUDY, A. F., JR.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER, BIOENVIRONMENTAL ENGINEERING LABS.
AVAIL WATER AND SEWAGE WORKS, REFERENCE ISSUE, P 48, 50-52, 54-56, APRIL, 1977. 11 FIG, 10 REF.

TITLE COMPARING DESIGN MODELS FOR ACTIVATED SLUDGE.
AUTHOR GAUDY, A. F., JR.; KINCANNON, D. F.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER. BIOENVIRONMENTAL ENGINEERING LABS.
AVAIL WATER AND SEWAGE WORKS, VOL 124, NO 2, P 66-70, FEBRUARY 1977. 1 FIG, 7 TAB, 16 REF.

TITLE COMPARISON OF COMPLETELY MIXED AND PLUG FLOW BIOLOGICAL SYSTEMS.
AUTHOR TOERBER, E. D.; PAULSON W. L.; SMITH, H. S.

CORP AUTH FEHR AND GRAHAM CONSULTING ENGINEERS, FREEPORT, ILL.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 46, NO 8, P 1995-2014, AUGUST 1974. 26 FIG, 9 TAB, 3 REF.

TITLE COMPUTER-ASSISTED ACTIVATED SLUDGE PLANT OPERATION.
AUTHOR LACROIX, P. G.; BLOODGOOD, D. E.
CORP AUTH OTTAWA UNIV. (ONTARIO). DEPT. OF CIVIL ENGINEERING.
AVAIL EFFLUENT AND WATER TREATMENT JOURNAL, VOL 13, NO 11, P 701-714, NOVEMBER 1973. 3 FIG, 2 TAB, 26 REF.

TITLE CONTROL OF ACTIVATED SLUDGE BULKING DURING BIOLOGICAL PURIFICATION (REGULIROVANIE PRIROSTA AKTIVNOGO ILA PRI BIOLOGICHESKOI OCHISTKE).
AUTHOR EVILEVICH, M. A.; KOROVIN, L. K.
CORP AUTH GIPROBUM (USSR).
AVAIL BUMAZHNAYA PROMYSHLENNOST, NO 8, P 27-28, AUGUST, 1978. 3 FIG, 1 TAB.

TITLE CONTROL OF ACTIVATED SLUDGE BY MEAN CELL RESIDENCE TIME.
AUTHOR JENKINS, DAVID; GARRISON, WALTER E.
CORP AUTH CALIFORNIA UNIV., BERKELEY. SANITATION ENGINEERING RESEARCH LAB.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 11, PART 1, P 1905-1919, NOV 1968. 6 FIG, 2 TAB, 15 REF.

TITLE DEMONSTRATION OF A HIGH-RATE ACTIVATED SLUDGE SYSTEM.
AUTHOR HUANG, C. H.; FEURSTEIN, D. L.; MILLER, E. L.
CORP AUTH ENGINEERING-SCIENCE, INC., BERKELEY, CALIF.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-240 005, IN PAPER COPY, IN MICROFICHE, REPORT EPA-670/2-75-037, MARCH 1975. 150 P, 25 FIG, 22 TAB, 46 REF, 1 APPEND.

TITLE DESIGN AND CONTROL OF NITRIFYING ACTIVATED SLUDGE. SYSTEMS.
AUTHOR LAWRENCE, A. W.; BROWN, C. G.
CORP AUTH CORNELL UNIV., ITHACA, NY DEPT. OF ENVIRONMENTAL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 7, P 1779-1803, JULY 1976. 13 FIG, 8 TAB,

TITLE THE DESIGN AND OPERATION OF ACTIVATED SLUDGE FINAL SETTLING TANKS.
AUTHOR HIBBERD, R. L.; JONES, W. F.
CORP AUTH SATEC LTD., CREWE (ENGLAND).
AVAIL WATER POLLUTION CONTROL, VOL 78, NO 1, P 14-32, 1974, 13 FIG, 9 TAB, 11 REF.

TITLE THE DESIGN AND SELECTION OF MECHANICAL AERATION DEVICES.
AUTHOR SHAW, J. A.
CORP AUTH LIGHTNIN MIXER PTY LTD., CAMBERWELL (AUSTRALIA).
AVAIL IN: WATER POLLUTION CONTROL IN DEVELOPING COUNTRIES. PROCEEDINGS OF THE INTERNATIONAL CONFERENCE, HELD AT BANGKOK, THAILAND, FEBRUARY 1978. EDITED BY E.A.R. OUANO, B. M. LOHANI & C.M. THANH. ASIAN INSTITUTE OF TECHNOLOGY, BANGKOK, THAILAND, (PERGAMON PRESS IN USA), P 709-722, 1978. 13 FIG.

TITLE DESIGNING AND OPERATING AN OXYGEN ACTIVATED SLUDGE SYSTEM INCLUDING TERTIARY ALUM-MUD PRECIPITATION.
AUTHOR FULLER, R. R.; GILBERT, D. W.
CORP AUTH GULF STATES PAPER CORP., TUSCALOOSA, AL.
AVAIL COPYRIGHT CLEARANCE CENTER, INC., NEW YORK, NY AS 0065-8812-78-9661-0178 ($1.25). IN: WATER--1977, AICHE SYMPOSIM SERIES, VOL 74, NO 178, EDITED BY G. F. /BENNETT, P 48-65, 1978, 6 FIG, 6 TAB, 3 REF.

TITLE DESIGN AND OPERATIONAL MODEL FOR COMPLETE MIXING ACTIVATED SLUDGE SYSTEM.
AUTHOR MCKINNEY, R. E.
CORP AUTH KANSAS UNIV., LAWRENCE.
AVAIL BIOTECHNOLOGY AND BIOENGINEERING, VOL 16, NO 6, P 703-722, JUNE, 1974. 14 REF.

TITLE EFFECT OF PRIMARY EFFLUENT SUSPENDED SOLIDS AND BOD ON ACTIVATED SLUDGE PRODUCTION.
AUTHOR VOSHEL, DORIS; SAK, J. G.
CORP AUTH GRAND RAPIDS WATER POLLUTION CONTROL PLANT, MICH., AND DOW CHEMICAL CO., MIDLAND, MICH.
AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 5, PART 2, P R203-R212, MAY 1968. 8 FIG, 3 TAB, 10 REF.

TITLE EFFECT OF WASTEWATER COMPOSITION AND CELL RESIDENT TIME ON PHOSPHORUS REMOVAL IN ACTIVATED SLUDGE.
AUTHOR STALL, T. R.; SHERRARD, J. H.
CORP AUTH PHILLIPS PETROLEUM CO., BARTLESVILLE, OKLA.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 2, P 307-322, FEBRUARY, 1976, 8 FIG, 4 TAB, 23 REF.

TITLE EFFECTS OF DISSOLVED OXYGEN IN THE OXYGENATION ACTIVATED SLUDGE PROCESS.
AUTHOR D'ANTONI, J. M.; STEIMLE, S. E.
CORP AUTH NUS CORP., HOUSTON, TX.
AVAIL COPYRIGHT CLEARANCE CENTER, INC., NEW YORK, NY AS 0065-8812-78-9823-1078 ($0.95). IN: WATER-1977, AICHE SYMPOSIUM SERIES, VOL 74, NO 178, EDITED BY G. F. BENNETT, P 66-74, 1978, 9 FIG, 2 TAB, 10 REF.

TITLE EFFECTS OF FLOW EQUALIZATION ON THE OPERATION AND PERFORMANCE OF AN ACTIVATED SLUDGE PLANT.
AUTHOR FOESS, G. W.; MEENAHAN, J. G.; BLOUGH, D.
CORP AUTH YPSILANTI TOWNSHIP, MI.
AVAIL THE NATIONAL TECHNICAL INFORMAITON SERVICE, SPRINGFIELD, VA 22161 AS PB-272 657, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-77-138, 1977. 95 P, 8 FIG, 17 TAB, 20 REF, 1 APPEND.

TITLE THE EFFECT OF HIGH PURITY OXYGEN ON THE ACTIVATED SLUDGE PROCESS.
AUTHOR BENEFIELD, L. D.; RANDALL, C. W.; KING, P. H.
CORP AUTH MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 2, P 269-279, FEBRUARY, 1977. 17 FIG, 1 TAB, 12 REF.

TITLE EFFECTS OF IRON ON ACTIVATED SLUDGE TREATMENT.
AUTHOR CARTER, J. L.; MCKINNEY, R. E.
CORP AUTH MARQUETTE UNIV., MILWAUKEE, WIS.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL 99, NO EE2, P 135-152, APRIL 1973. 9 FIG, 3 TAB, 24 REF.

TITLE THE EFFECT OF SLUDGE WITHDRAWALS ON THE OPERATION OF SMALL ACTIVATED SLUDGE PLANTS.
AUTHOR DRAUTZ, K. E.
CORP AUTH RENSSELAER POLYTECHNIC INST., TROY, NY
AVAIL MASTERS'S THESIS, JUNE 1969. 111 P, 15 FIG, 34 TAB, 17 REF.

TITLE EVALUATION OF A COMPLETE MIXING ACTIVATED SLUDGE PLANT.
AUTHOR MCKINNEY, ROSS E.; BENJES, HENRY H., JR.; WRIGHT, JAMES R.
CORP AUTH KANSAS UNIV., LAWRENCE.
AVAIL JOURNAL OF WATER POLLUTION CONTROL FEDERATION, VOL 42, NO 5, PART 1, P 737-752, MAY 1970. 10 FIG, 1 TAB, 19 REF.

TITLE EVALUATION OF THE KRAUS MODEL OF ACTIVATED SLUDGE BULKING.
AUTHOR PIPES, WESLEY O.; MEADE, FRANK S.
CORP AUTH NORTHWESTERN UNIV., EVANSTON, ILL.
AVAIL PROCEEDINGS INDUSTRIAL WASTE CONFERENCE, 23RD, MAY 1968, P 111-125, 5 FIG, 7 TAB, 8 REF.

TITLE AN EXPERIMENTAL STUDY OF THE ROLE OF THE CILIATED PROTOZOA IN THE ACTIVATED SLUDGE PROCESS.
AUTHOR CURDS, C. R.; COCKBURN, A.; VANDYKE, JENNIFER M.
CORP AUTH WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
AVAIL WATER POLLUTION CONTROL, VOL 67, NO 3, 1968. P 312-329, 14 FIG, 3 TAB, 13 REF.

TITLE FACTORS AFFECTING EFFLUENT QUALITY FROM FILL-AND-DRAW ACTIVATED SLUDGE REACTORS.
AUTHOR DAIGGER, G. T.; GRADY, C. P. L., JR.
CORP AUTH PURDUE UNIV., LAFAYETTE, IN. ENVIRONMENTAL ENGINEERING LAB.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 12, P 2390-2396, DECEMBER, 1977. 1 FIG, 4 TAB, 12 REF.

TITLE FACTORS TO BE CONSIDERED IN THE DESIGN OF ACTIVATED SLUDGE PLANTS.
AUTHOR DOWNING, A. L.
CORP AUTH WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
AVAIL ADVANCES IN WATER QUALITY IMPROVEMENTS, (EDITORS: GLOYNA, E. F., AND ECKENFELDER, W. W., JR.), AUSTIN, TEXAS, UNIVERSITY OF TEXAS PRESS, 1968, P 190-202, 3 FIG, 14 REF.

TITLE FATE OF PHOSPHORUS IN WASTE TREATMENT PROCESSES: ENHANCED REMOVAL OF PHOSPHATE BY ACTIVATED SLUDGE.
AUTHOR MENAR, ARNOLD, B.; JENKINS, DAVID
CORP AUTH CALIFORNIA UNIV., RICHMOND. SANITARY ENGINEERING RESEARCH LAB.

AVAIL ENVIRONMENTAL SCIENCE AND TECHNOLOGY, VOL 4, NO 12, P 1115-1121, DECEMBER 1970. 6 TAB, 6 FIG, 12 REF.

TITLE FEDERAL ASSISTANCE PROJECT METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1. OCTOBER 1969 - FEBRUARY 1970.
AUTHOR HEGG, BOB A.; BURGESON, JOHN R.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, KANSAS CITY, MO.
AVAIL MARCH 1971, 42 P, 5 TAB, 6 FIG, 12 REF.

TITLE FULL SCALE OPERATION OF PLUG FLOW ACTIVATED SLUDGE SYSTEMS.
AUTHOR BEER, C.; HETLING, L. J.; WANG, L. K.
CORP AUTH NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY; AND RENSSELAER POLYTECHNIC INST., TROY.
AVAIL NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION, TECHNICAL REPORT NO 42, AUG 1975, PRESENTED AT THE NEW ENGLAND WATER POLLUTION CONTROL ASSOCIATION MEETING, HARTFORD, CONN., OCTOBER 23, 1974, 45 P, 13 FIG, 7 TAB, 16 REF. EPA PROJECT 17050 EDL.

TITLE INDUSTRIAL WASTE PROCESS DESIGN.
AUTHOR ECKENFELDER, W. W., JR.; O'CONNER, D. J.
CORP AUTH MANHATTAN COLL., BRONX, NY. DEPT. OF CIVIL ENGINEERING.
AVAIL PROCEEDINGS AMERICAN SOCIETY OF CIVIL ENGINEERS, FEBRUARY 15-19, 1954, SANITARY ENGINEERING DIVISION, VOL 80, NO 411, P 411-1 TO 411-25. 13 FIG, 5 TAB, 26 REF.

TITLE INFLUENCE OF ACTIVATED SLUDGE CRT ON ADSORPTION.
AUTHOR KIM, B. R.; SNOEYINK, V. L.; SAUNDERS, F. M.
CORP AUTH ILLINOIS UNIV. AT URBANA-CHAMPAIGN, DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION PROCEEDINGS OF ASCE, VOL 102, NO EE1, P 55-70, FEBRUARY, 1976. 12 FIG, 2 TAB, 21 REF, 1 APPEND.

TITLE THE INFLUENCE OF PH AND ORGANIC LOADING ON THE FILAMENTATOUS BULKING OF ACTIVATED SLUDGE.
AUTHOR YASUDA, M.
CORP AUTH TOYAMA COLL. OF TECH. (JAPAN). DEPT. OF SANITARY ENGINEERING.
AVAIL TRANSACTIONS OF THE JAPAN SOCIETY OF CIVIL ENGINEERS, VOL 8, P 131-132, 1976. 5 FIG, 1 TAB.

TITLE INSTANTANEOUS METERING AIDS - ACTIVATED SLUDGE PLANT.
AUTHOR MATZNER, B. A.
CORP AUTH SUFFOLK COUNTY DEPT. OF ENVIRONMENTAL CONTROL, HAUPPAUGE, NY OPERATIONS DIV.
AVAIL WATER AND WASTES ENGINEERING, VOL 13, NO 8, P 18-20, AUGUST, 1976.

TITLE INTRODUCTION TO WASTEWATER TREATMENT PROCESSES.
AUTHOR RAMALHO, R. S.
CORP AUTH LAVAL UNIV., QUEBEC.
AVAIL ACADEMIC PRESS (NEW YORK, SAN FRANCISCO, LONDON). 1977. 409 P.

TITLE INVENTORY OF ENERGY USE IN WASTEWATER SLUDGE TREATMENT AND DISPOSAL.
AUTHOR SMITH, J. E.
AVAIL INDUSTRIAL WATER ENGINEERING, VOL 14, NO 4, P 20-26, JULY/AUGUST, 1977. 12 FIG, 10 TAB.

TITLE A KINETIC MODEL FOR DESIGN OF COMPLETELY-MIXED ACTIVATED SLUDGE TREATING VARIABLE-STRENGTH INDUSTRIAL WASTEWATERS.
AUTHOR ADAMS, C. E.; ECKENFELDER, W. W.; HOVIOUS, J. C.
CORP AUTH ASSOCIATED WATER AND AIR RESOURCES ENGINEERS, INC., NASHVILLE, TENN.
AVAIL WATER RESEARCH, VOL 9, NO 1, P 37-42, JANUARY 1975. 4 FIG, 1 TAB, 5 REF.

TITLE LEAST COST DESIGN OF ACTIVATED SLUDGE SYSTEMS.
AUTHOR MIDDLETON, A. C.; LAWRENCE, A. W.
CORP AUTH CORNELL UNIV., ITHACA, NY DEPT. OF ENVIRONMENTAL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 5, P 889-905 MAY 1976. 11 FIG, 11 TAB, 17 REF.

TITLE LOAD BALANCING AT SEWAGE-TREATMENT WORKS: THE SOUTHAMPTON UNIVERSITY PILOT PLANT AT MILLBROOK.
AUTHOR HELLIWELL, P. R.; REED, R. J. R.
CORP AUTH SOUTHAMPTON UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL OF THE INSTITUTE OF WATER POLLUTION CONTROL, VOL 76, NO 3, P 355-372, 1977. 14 FIG, 2 TAB, 10 REF.

181

TITLE LONG-TERM PERFORMANCE OF A COUPLED TRICKLING FILTER-ACTIVATED SLUDGE PLANT.
AUTHOR STENQUIST, R. J.; PARKER, D. S.; LOFTIN, W. E.; BRENNER, R. C.
CORP AUTH BROWN AND CALDWELL, WALNUT CREEK, CA
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 1, P 2265-2284, NOVEMBER, 1977. 15 FIG, 10 TAB, 8 REF.

TITLE MANY DESIGN PROBLEMS OVERCOME IN STATEN ISLAND PLANT.
AUTHOR MITCHELL, R. D.
CORP AUTH PIRNIE (MALCOLM), INC., WHITE PLAINS, NY
AVAIL WATER AND WASTES ENGINEERING, VOL 13, NO 12, P 57-59, 68, DECEMBER, 1976. 1 FIG, 1 TAB.

TITLE METHOD FOR MEASURING AEROBIC DECOMPOSITION ACTIVITY OF ACTIVATED SLUDGE IN AN OPEN SYSTEM.
AUTHOR FARKAS, PETER
CORP AUTH RESEARCH INST. FOR WATER RESOURCES DEVELOPMENT, BUDAPEST (HUNGARY).
AVAIL FOURTH INTERNATIONAL CONFERENCE ON WATER POLLUTION RESEARCH, PRAGUE, CZECH., SEPTEMBER 2-6, 1968. PREPRINT, SEC, II, PAPER 1, 9 P, 6 FIG, 1 TAB, 15 REF.

TITLE MICROBIOLOGY OF WASTE TREATMENT
AUTHOR UNZ, R. F.
CORP AUTH PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 45, NO 6, P 1259-1265, JUNE 1973, 67 REF.

TITLE MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW).
AUTHOR UNZ, R. F.
CORP AUTH PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 6, P 1255-1268, JUNE, 1977. 130 REF.

TITLE MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW).
AUTHOR UNZ, F. F.
CORP AUTH PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 6, P 1367-1378, JUNE, 1976. 101 REF.

TITLE MICROSCOPIC OBSERVATION OF ACTIVATED SLUDGE APPLIED TO THE MONITORING OF TREATMENT PLANTS (L'OBSERVATION MICROSCOPIQUES DES BOUES ACTIVEES APPLIQUE A LA SURVEILLANCE DES INSTALLATIONS D'EPURATION: TECHNIQUE D'ETUDE INTERPRETATION).
AUTHOR DRAKIDES, C.
CORP AUTH MONTPELLIER-2 UNIV. (FRANCE). LAB. DE GENIE CHIMIQUE, TRAITEMENT ET EPURATION DES EAUX.
AVAIL TECHNIQUES ET SCIENCES MUNICIPALES-L'EAU, VOL 73, NO 2, P 85-98, FEBRUARY, 1978. 18 FIG, 16 REF.

TITLE MODELING AND OPTIMIZATION OF STEP AERATION WASTE TREATMENT SYSTEMS.
AUTHOR ERICKSON, LARRY E.; HO, Y. S.; FAN, L. T.
CORP AUTH KANSAS STATE UNIV., MANHATTAN.
AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 5, PART 1, P 717-732, MAY 1968. 6 FIG, 2 TAB, 5 REF.

TITLE MODULES PERMIT EASY EXPANSION.
AUTHOR WEAVER, J. H.
CORP AUTH ROBERT AND CO. ASSOCIATES, WEST PALM BEACH, FLA.
AVAIL WATER ANMD WASTES ENGINEERING, VOL 13, NO 11, P 73-74, NOVEMBER, 1976, 1 FIG.

TITLE NEW SYSTEM PUTS THE WOOD TO WASTEWATER.
AUTHOR WEBER, C. L.; JACOBSON, C. D.
CORP AUTH KIRKHAM MICHAEL AND ASSOCIATES, OMAHA, NEBR.
AVAIL WATER AND WASTES ENGINEERING, VOL 12, NO 12, P 51-52, 64, DECEMBER, 1975. 1 FIG.

TITLE NITRIFICATION AND HEAVY METAL REMOVAL IN THE ACTIVATED SLUDGE TREATMENT PROCESS.
AUTHOR RICHARDS, P. A.
CORP AUTH TEXAS A AND M UNIV., COLLEGE STATION.
AVAIL UNIVERSITY MICROFILMS, INC., ANN ARBOR, MICH., 48106. ORDER NO. 77-2662. PHD THESIS, 1976. 182 P.

TITLE NITRIFICATION IN ACTIVATED SLUDGE PLANTS - GUIDELINES ON SOME OPERATION AND DESIGN ASPECTS.
AUTHOR SMITH, A. G.
CORP AUTH ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. WASTEWATER TREATMENT SECTION.
AVAIL RESEARCH PUBLICATION, W62, 1976. REVISED JULY 1977, 97 P, 17 FIG, 12 TAB, 66 REF.

183

TITLE NITRIFICATION IN HIGH-SLUDGE AGE CONTACT STABILIZATION.
AUTHOR ZOLTEK, J., JR.; LEFEBVRE, L.
CORP AUTH FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 9, P 2183-2189, SEPTEMBER, 1976. 4 FIG, 1 TAB, 11 REF.

TITLE NITRIFICATION IN TREATMENT PLANTS AND NATURAL WATERS: SOME IMPLICATIONS OF THE THEORETICAL MODELS.
AUTHOR DOWNING, A. L.; KNOWLES, G.
CORP AUTH WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
AVAIL FIFTH INTERNATIONAL WATER POLLUTION RESEARCH CONFERENCE, SAN FRANCISCO, JULY 26-AUGUST 1, 1970. PREPRINT, PAPER I-8, 8 P, 4 FIG, 1 TAB, 6 REF.

TITLE NITROGEN REMOVAL AND IDENTIFICATION FOR WATER QUALITY CONTROL.
AUTHOR CARLSON, DALE A.
CORP AUTH WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
AVAIL NATIONAL TECHNICAL INFORMATION SERVICE AS PB-204 231, $3.00 IN PAPER COPY, $0.95 IN MICROFICHE, AUGUST 15, 1971. 52 P, 12 FIG, 8 TAB, 85 REF. OWRR A-040-WASH(1).

TITLE ONE-VERSUS TWO-STATE NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS.
AUTHOR STOVER, E. L.; KINCANNON, D. F.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER. SCHOOL OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 4, P 645-651, APRIL, 1976. 6 FIG, 17 REF.

TITLE OPERATING ACTIVATED-SLUDGE PLANTS TO EFFECT NUTRIENT REMOVAL.
AUTHOR NICHOLLS, H. A.
AVAIL WATER POLLUTION CONTROL, VOL 77, NO 1, P 99-101, 1978.

TITLE OPERATING EXPERIENCE AND DESIGN CRITERIA FOR "UNOX" WASTEWATER TREATMENT SYSTEMS, DESIGN SEMINAR FOR WASTEWATER TREATMENT FACILITIES.
CORP AUTH UNION CARBIDE CORP., TONAWANDA, NY LINDE DIV.

AVAIL REPORT PREPARED FOR ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC, TECHNOLOGY TRANSFER PROGRAM, FOR SEMINAR AT NEW YORK, NY, FEBRUARY 29-MARCH 2, 1972. 68 P.

TITLE OPERATION OF CONVENTIONAL ACTIVATED SLUDGE FOR MAXIMUM PHOSPHORUS REMOVAL.
AUTHOR MILBURY, WILLIAM F.; MCCAULEY, DONALD; HAWTHORNE, CHARLES H.
CORP AUTH WESTON (ROY F.), INC., WEST CHESTER, PA.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 43, NO 7, JULY 1971, P 1890-1901. 3 FIG, 3 TAB, 7 REF.

TITLE OPERATIONAL CONTROL PROCEDURES FOR THE ACTIVATED SLUDGE PROCESS. PART III-B. CALCULATION PROCEDURES FOR STEP-FEED PROCESS RESPONSES.
AUTHOR WEST, A. W.
CORP AUTH NATIONAL FIELD INVESTIGATIONS CENTER-CINCINNATI, OH.
AVAIL REPORT, 1975. 31 P, 7 FIG, 2 TAB.

TITLE OPTIMIZATION OF THE ACTIVATED SLUDGE PROCESS-OPTIMUM VOLUME RATIO OF AERATION AND SEDIMENTATION VESSELS.
AUTHOR NAITO, M.; TAKAMATSU, T.; FAN, L. T.
CORP AUTH KANSAS UNIV., LAWRENCE. DEPT. OF CHEMICAL AND PETROLEUM ENGINEERING; AND KYOTO UNIV. (JAPAN). DEPT.
AVAIL WATER RES, VOL 3, NO 6, P 433-443, JUNE 1969. 8 FIG, 6 REF.

TITLE OPTIMIZE THE EFFLUENT SYSTEM. PART 6: BIOCHEMISTRY OF ACTIVATED SLUDGE PROCESS.
AUTHOR GRUTSCH, J. F.; MALLATT, R. C.
CORP AUTH STANDARD OIL CO. (INDIANA), CHICAGO, IL.
AVAIL HYDROCARBON PROCESSING, VOL 55, NO 8, P 137-142, AUGUST, 1976. 7 FIG, 2 TAB, 15 REF.

TITLE THE ORBAL EXTENDED AERATION ACTIVATED SLUDGE PLANT.
AUTHOR DREWS, R. L. C.; MALAN, W. M.; MEIRING, P. G. J.; MOFFATT, B.
CORP AUTH NATIONAL INST. FOR WATER RESEARCH, PRETORIA (SOUTH AFRICA).
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 44, NO 2, FEBRUARY 1972, P 221-231, 6 FIG, 5 TAB, 4 REF.

TITLE ORGANIC MATTER REMOVAL BY POWDERED ACTIVATED CARBON ADDED TO ACTIVATED SLUDGE.
AUTHOR DEWALLE, F. B.; CHIAN, E. S. K.; SMALL, E. M.
CORP AUTH ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 4, P 593-599, APRIL, 1977. 5 FIG, 1 TAB, 19 REF.

TITLE OXYGEN-ACTIVATED SLUDGE PLANT COMPLETES TWO YEARS OF SUCCESSFUL OPERATION.
AUTHOR MCDOWELL, C. S.; GIANELLI, J.
CORP AUTH AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-272 271, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-77-040, JULY 1977. 195 P, 75 FIG, 12 TAB, 9 REF, 2 APPWEND.

TITLE OXYGEN AERATION AT NEWTON CREEK.
AUTHOR NASH, N.; KRASNOFF, P. J.; PRESSMAN, W. B.; BRENNER, R. C.
CORP AUTH NEW YORK STATE DEPT. OF WATER RESOURCES, NEW YORK.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 3, P 388-400, MARCH 1977, 4 FIG, 6 TAB, EPA PROJECT 11010 GEV.

TITLE PHOSPHORUS REMOVAL WITH PICKLE LIQUOR IN AN ACTIVATED SLUDGE PLANT.
CORP AUTH MILWAUKEE SEWERAGE COMMISSION, WIS.
AVAIL GPO SUP DOC. $1.25; MICROFICHE FORM NTIS AS PB-208 216, $0.95. ENVIRONMENTAL PROTECTION AGENCY WATER POLLUTION CONTROL RESEARCH SERIES, MARCH 1971. 143 P, 25 FIG, 7 TAB, 19 REF. EPA PROGRAM 11010 FIQ--03/71.

TITLE PHYSICAL CONDITIONING OF ACTIVATED SLUDGE FLOC.
AUTHOR PARKER, DENNY S.; KAUFMAN, WARREN J.; JENKINS, DAVID.
CORP AUTH CALIFORNIA UNIV., BERKELEY.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 43, NO 9, P 1817-1833, SEPTEMBER 1971. 14 FIG, 6 TAB, 25 REF.

TITLE PLANT DATA ANALYSIS OF TEMPERATURE SIGNIFICANCE IN THE ACTIVATED SLUDGE PROCESS.
AUTHOR LIN, K-C.; HEINKE, G. W.
CORP AUTH NEW BRUNSWICK UNIV., FREDERICKTON. DEPT. OF CIVIL ENGINEERING.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 49, NO 2, P 286-295, FEBRUARY, 1977. 4 FIG, 3 TAB, 18 REF, 1 APPEND.

TITLE POLLUTION ABATEMENT IN A BREWING FACILITY.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC, TECHNOLOGY TRANSFER STAFF.
AVAIL EPA TECHNOLOGY TRANSFER CAPSULE REPORT NO. 6, (1974). 17 P, 8 FIG, 6 TAB.

TITLE POLYMER ADDITION IMPROVES WASTE WATER TREATMENT PROCESS.
AUTHOR CHURCHILL, R. J.; RYBACKI, R. L.
CORP AUTH PETROLITE CORP., ST. LOUIS, MO. TRETOLITE DIV.
AVAIL WATER AND SEWAGE WORKS, REFERENCE ISSUE, P 10-12, 14-17, 20, APRIL, 1977. 8 FIG, 2 TAB, 5 REF.

TITLE PROCESS CONTROL OF ACTIVATED SLUDGE TREATMENT.
AUTHOR KERMODE, R. I.; BRETT, R. W. J.
CORP AUTH KENTUCKY WATER RESOURCES INST., LEXINGTON.
AVAIL NTIS AS PB-227 238 $4.00 IN PAPER COPY, $1.45 IN MICROFICHE. RESEARCH REPORT NO 63, 1973. 88 P, 18 FIG. 40 REF, 9 TAB. OWRB(1) A-040-KY. 14-31-0001-3517. 14-31-0001-3817.

TITLE PROCESS CONTROL OF ACTIVATED SLUDGE TREATMENT, PHASE II.
AUTHOR KERMODE, R. I.; BRETT, R. W. J.; PAULT, J. D., JR.
CORP AUTH KENTUCKY WATER RESOURCES INST., LEXINGTON.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-240 176, $4.75 IN PAPER COPY, $2.25 IN MICROFICHE. RESEARCH REPORT NO. 83, JANUARY 1975. 87 P, 29 FIG, 14 TAB, 14 REF. OWRT A-050-KY(1). 14-31-0001-4017.

TITLE PROCESS DESIGN MANUAL FOR UPGRADING EXISTING WASTEWATER TREATMENT PLANTS.
CORP AUTH WESTON (ROY F.), INC., WEST CHESTER, PA
AVAIL EPA REGIONAL OFFICE TECHNOLOGY TRANSFER; IN MICROFICHE FROM NTIS AS PB-214 550 FOR $1.45. ENVIRONMENTAL PROTECTION AGENCY, TECHNOLOGY TRANSFER MANUAL, OCTOBER 1971, 275P. EPA PROJECT 17090 GNQ, CONTRACT 14-12-933.

TITLE PROCESS OPTIMA IN ACTIVATED SLUDGE.
AUTHOR POLOCSIK, S.; GRIEVES, R. B.: PIPES, W. O. JR.
CORP AUTH ILLINOIS INST. OF TECH., CHICAGO.

AVAIL PROCEEDINGS, INDUSTRIAL WASTE CONFERENCE, 20TH, MAY 4, 5, 6, 1965, PURDUE UNIVERSITY, VOL XLIX, NO 4, P 197-209, JULY 1965. 5 FIG, 1 TAB, 4 REF. PUBLIC HEALTH SERVICE TRAINING GRANT NO 5T1ES26-02.

TITLE PROCESS STABILITY OF ACTIVITY SLUDGE PROCESSES.
AUTHOR CHIANG, C. H.
CORP AUTH PIRNIE (MALCOLM), INC., WHITE PLAINS, NY
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION-ASCE, VOL 103, NO EE2, P 259-271, APRIL, 1977. 3 FIG, 3 TAB, 2 APPEND.

TITLE ROLE OF NITROGEN IN ACTIVATED SLUDGE PROCESS.
AUTHOR WU, Y. C.
CORP AUTH PITTSBURGH UNIV., PA. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL 102, NO EE5, PROCEEDINGS PAPER NO 12454, P 897-907, OCTOBER 1976.

TITLE SECONDARY TREATMENT.
AVAIL IN: 1977 PUBLIC WORKS MANUAL AND CATALOG FILE, BILLINGS, C. H., CONNER, S. H., AND KIRCHER, J. R., EDITORS, P D24-D32, 1977. 1 FIG.

TITLE SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE.
AUTHOR REED, SHERWOOD
CORP AUTH COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
AVAIL NTIS AS AD-717 239, $3.00 IN PAPER COPY, $0.95 IN MICROFICHE. CRREL TECHNICAL REPORT 203, NOV 1970. 30 P, 17 FIG, 5 TAB, 25 REF.

TITLE SEWAGE TREATMENT WORKS FOR SMALL COMMUNITIES--A NEED FOR CAREFUL DESIGN AND OPERATION.
AUTHOR DREWS, R. J. L. C.; DENYSSCHEN, J. H.
CORP AUTH NATIONAL INST. FOR WATER RESEARCH, PRETORIA (SOUTH AFRICA).
AVAIL IN: WATER POLLUTION CONTROL IN DEVELOPING COUNTRIES. PROCEEDINGS OF THE INTERNATIONAL CONFERENCE HELD AT BANGKOK, THAILAND, FEBRUARY 1978. EDITED BY E.A.R. OUANO, B. M. LOHANI, N. C. THANH. ASIAN INSTITUTE OF TECHNOLOGY, BANGKOK, THAILAND (PERGAMON PRESS IN USA), P 381-397, 1978, 7 FIG, 1 TAB, 9 REF.

TITLE SHOCK LOAD RESPONSE OF ACTIVATED SLUDGE WITH CONSTANT RECYCLE SLUDGE CONCENTRATION.

AUTHOR SALEH, M. M.; GAUDY, A. F., JR.

CORP AUTH EL-AZHAR UNIV., CAIRO (EGYPT). SCHOOL OF CIVIL ENGINEERING.

AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 50, NO 4, P 764-774, APRIL, 1978. 190 FIG, 1 TAB, 11 REF.

TITLE SIMPLIFIED OPTIMIZATION OF ACTIVATED SLUDGE PROCESS.

AUTHOR GRADY, C. P. L., JR.

CORP AUTH PURDUE UNIV., LAFAYETTE, INDIANA, SCHOOL OF CIVIL ENGINEERING.

AVAIL JOURNAL OF THE ENVIRONMENTAL ENGINEERING DIVISION, PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL 103, NO EE3, PROCEEDINGS PAPER NO. 12974, P 413-429, JUNE 1977. 3 FIG, 6 TAB, 19 REF.

TITLE START-UP OF NEW WASTE WATER TREATMENT PLANTS.

AUTHOR CAVERLY, D. S.

CORP AUTH ONTARIO WATER RESOURCES COMMISSION, TORONTO

AVAIL JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 4, P 571-580, APRIL 1968.

TITLE SYSTEM ALTERNATIVES IN OXYGEN ACTIVATED SLUDGE.

AUTHOR STAMBERG, J. B.; BISHOP, D. F.; BENNETT, S. M.; HAIS, A. B.

CORP AUTH DISTRICT OF COLUMBIA DEPT. OF ENVIRONMENTAL SERVICES, WASHINGTON.

AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161, AS PB-241 310, $4.25 IN PAPER COPY, $2.25 in MICROFICHE. ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO. REPORT EPA-670/2-75-008, APRIL 1975. 59 P, 22 FIG, 7 TAB, 26 REF. 1BB043 ROAP 21-ASR TASK-015 68-01-0162.

TITLE TECHNICAL ASSISTANCE PROJECT FORT COLLNS WASTEWATER TREATMENT FACILITY FORT COLLINS, COLORADO, JANUARY - FEBRUARY, 1973.

CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, DENVER, CO. REGION VIII.

AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-255 573, IN PAPER COPY, IN MICROFICHE. REPORT S AND A/TSB - 22, 1973 25 P, 4 FIG.

189

TITLE TECHNICAL ASSISTANCE PROJECT VAIL WASTEWATER TREATMENT FACILITY VAIL, COLORADO, MARCH - APRIL 1973.
CORP AUTH ENVIRONMENTAL PROTECTION AGENCY, DENVER, CO. REGION VIII.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-255 257, IN PAPER COPY, IN MICROFICHE. REPORT SA/TSB-21, 1973. 31 P, 4 FIG, 2 REF.

TITLE TEMPERATURE EFFECTS ON THE ACTIVATED SLUDGE PROCESS.
AUTHOR SAYIGH, B. A.; MALINA, J. F., JR.
CORP AUTH TEXAS UNIV. AT AUSTIN. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 50 NO 4, P 678-687, APRIL, 1978. 13 FIG, 18 REF.

TITLE TEMPERATURE EFFECTS ON GROWTH AND YIELD OF ACTIVATED SLUDGE.
AUTHOR FRIEDMAN, A. A.; SCHROEDER, E. D.
CORP AUTH TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE. DEPT. OF CIVIL ENGINEERING.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 44, NO 7, P 1433-1442, JULY 1972, 8 FIG, 3 TAB, 25 REF.

TITLE TOWARD A MORE MEANINGFUL INDEX OF SLUDGE QUALITY.
AUTHOR FITCH, B.; KOS, P.
CORP AUTH CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 48, NO 8, P 1979-1987, AUGUST, 1976. 11 FIG, 1 REF.

TITLE TRACE ELEMENTS IN BIOLOGICAL WASTE TREATMENT IWTH SPECIFIC REFERENCE TO THE ACTIVATED SLUDGE PROCESS.
AUTHOR WOOD, D. K.; TCHOBANOGLOUS, G.
CORP AUTH CALIFORNIA UNIV., DAVIS.
AVAIL IN: PROCEEDINGS OF THE 29TH INDUSTRIAL WASTE CONFERENCE, MAY 7-9, 1974, PART 2, LAFAYETTE, INDIANA, PURDUE UNIVERSITY, P 648-661. 4 FIG, 6 TAB, 21 REF.

TITLE TRICKLING FILTER VERSUS ACTIVATED SLUDGE: WHEN TO SELECT EACH PROCESS.
AUTHOR KINCANNON, D. F.; SHERRARD, J. H.
CORP AUTH OKLAHOMA STATE UNIV., STILLWATER, SCHOOL OF CIVIL ENGINEERING.

AVAIL WATER AND SEWAGE WORKS, VOL 121, NO 4, P 32-34, 36 APRIL 30, 1974. 1 FIG, 4 TAB, 9 REF.

TITLE UNIFIED BASIS FOR BIOLOGICAL TREATMENT DESIGN AND OPERATION.
AUTHOR LAWRENCE, ALONZO W.: MCCARTY, PERRY L.
CORP AUTH STANFORD UNIV., CALIF.
AVAIL JOURNAL, SANITARY ENGINEERING DIVISION, PROCEEDINGS AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL 96, NO SA3, P 757-778, JUNE 1970. 4 FIG, 6 TAB, 48 REF.

TITLE WASTEWATER CHARACTERIZATION AND PROCESS RELIABILITY FOR POTABLE WASTEWATER RECLAMATION.
AUTHOR PETRASEK, A. C., JR.
CORP AUTH DALLAS WATER UTILITIES DEPT., TX.
AVAIL THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 AS PB-274 874, IN PAPER COPY, IN MICROFICHE. REPORT EPA-600/2-77-210, 1977. 124 P, 56 FIG, 22 TAB, 10 REF.

TITLE WASTEWATER TREATMENT DESIGN: ECONOMICS AND TECHNIQUES, PART I.
AUTHOR ECKENFELDER, W. W., JR.
CORP AUTH VANDERBILT UNIV., NASHVILLE, TENN.
AVAIL WATER AND SEWAGE WORKS, VOL 122, NO 6, P 63-65, JUNE, 1975. 67 FIG, 2 TAB.

TITLE WASTEWATER TREATMENT DESIGN, PART II.
AUTHOR ECKENFELDER, W. W., JR.
CORP AUTH VANDERBILT UNIV., NASHVILLE, TENN.
AVAIL WATER AND SEWAGE WORKS, VOL 122, NO 7, P 70, 75, JULY, 1975. 2 FIG, 1 TAB, 3 REF.

TITLE WASTEWATER TREATMENT PROBLEMS AT NORTH KANSAS CITY, MISSOURI.
AUTHOR SCHMIDT, P. J.
CORP AVAIL BLACK AND VEATCH, KANSAS CITY, MO
AVAIL JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 50, NO 4, P 635-644, APRIL, 1978. 5 FIG, 3 TAB.

TITLE WATER AND WASTEWATER TREATMENT.
AUTHOR SCHROEDER, E. D.
CORP AUTH CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
AVAIL MCGRAW-HILL, NEW YORK, NY 1977, 370 P. $3.95.

191

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980--657-165/0059